Mark Patterson
Nancy Hoalst-Pullen
Editors

The Geography of Beer

Regions, Environment, and Societies

Springer

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Editors
Mark Patterson
Geography and Anthropology
Kennesaw State University
Kennesaw
Georgia
USA

Nancy Hoalst-Pullen
Geography and Anthropology
Kennesaw State University
Kennesaw
Georgia
USA

ISBN 978-94-007-7786-6 ISBN 978-94-007-7787-3 (eBook)
DOI 10.1007/978-94-007-7787-3
Springer Dordrecht Heidelberg New York London

Library of Congress Control Number: 2014932211

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Printed on acid-free paper

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Foreword

The brewing industry has changed dramatically since I started working 39 years ago. The two primary changes, the globalization and rise of the huge multi-nationals and the growth of the very small specialty breweries may at first seem antithetical, but, I believe that the former definitely precipitated the latter. After prohibition in the mid 1930s there were over 750 breweries in the United States, mostly smaller breweries run by the descendants of German immigrants from the mid to late 1800s, while most large cities had at least one 1 million barrel brewery, and a few very large breweries were starting to push their distribution boundaries beyond their regional locations.

In 1975 I started at the lowest position, a union bottleshop employee at the Joseph Huber Brewing Company in Monroe, Wisconsin, a brewery founded by German immigrants in 1848. By this time the U.S. was down to only 45 brewing companies, with a few of the old smaller regionals barely hanging on in face of the advertising expenditures and economies of scale that the national brewers had at their disposal. It is amazing that of these multi-plant national brewers, Anheuser-Busch, Schlitz, Pabst, Miller, G. Heileman, Falstaff, and Carling-National, and the single brewery giants, Coors, Stroh, Hamm's, Olympia, Ballantine, Rheingold, Schaeffer and Genesee, not a single one any longer exists as a separate entity with the exception of Pabst which has become a contract or virtual brewer. All the rest have been combined, closed or bought by foreign multi-nationals. I would never have believed in 1975 that I would live to see the day that the once largest brewer in the world, Anheuser-Busch, would be bought by a Belgian/Brazilian consortium which was even bigger than they were and now together produces one quarter of all the beer in the world. They are being chased in their quest for global dominance by SAB-Miller, the conglomerate spawned by a brewing group that started with dominance in Africa and then went on to buy breweries in Eastern Europe as that area opened up following the collapse of the Soviet bloc, the merged U.S. operations of Miller and Coors and perhaps even more importantly, a 50% ownership in CRB, the largest brewing company in China, the producers of Snow, the single largest selling brand in the world.

China, which 7 years ago surpassed the U.S. as the largest brewing country in the world, has in the interim grown to the point where it is now producing twice as much beer and is still growing while the total volume in the mature North American market remains relatively stable.

Following AB-I and SAB-Miller are Heineken and Carlsberg who have both followed suit by buying up and building breweries around the world and they, in turn are followed by the other brewing giants including the Chinese brewers Tsingdao and Yanjing and Japanese brewers, Kirin and Asahi. The Japanese brewers are looking to expand outside their shores as they are faced with a declining population and a shrinking market. Kirin is now the owner of San Miguel in the Philippines as well as Lion Nathan which holds a 45% market share in Australia. The other major player in Australia is Fosters now owned by SAB-Miller. All of these companies continue to look for acquisitions and there will, no doubt, be mergers among them as well.

The rise of the large brewers in the United States created a void as they all produced similar styles of beer, 35% adjunct light tasting lagers with low bitterness units as well as low calorie beers which were even lighter in flavor and which achieved their low calorie level by reducing both residual sugars and more importantly the alcohol which is the bulk of the calories in most

beers. There were a few specialty beers in 1975, Yuengling Porter from the oldest brewery in the U.S. (1829), Ballantine India Pale Ale (50 I.B.U., 6% ABV and aged in wood for one year), Augsburger, a German style lager from Huber Brewing, but these were anomalies, not the norm.

To fill this vacuum came the first American micro-brewery, New Albion, in Sonoma, California in 1977. I was working at nearby Anchor Steam at the time and witnessed first hand their success and failure. New Albion produced an all malt hoppy and estery ale that was in contrast to the light lagers that constituted over 99% of the beer then produced in the U.S. The inspiration for this style of brewing was undoubtedly Anchor Steam, which while having a long history, was a very small brewery (11,000 bbls., 12,900 hl, in those days) producing an iconoclastic all malt amber beer that was strongly hopped. Soon other micro breweries started popping up in California and later across the country. Initially, quality was all over the map. These breweries were mostly started by former home brewers who were happy to be producing beers with an abundance of flavor without realizing in some cases that many of those flavors were off flavors produced by poor fermentations, contamination and the rudimentary equipment available to these early craft breweries. Gradually the quality of many of these breweries grew to a professional level and with this so did the size of many craft plants. Their success gave rise to even more breweries to the point where we now have over 2000 micro breweries and brewpubs in the United States and two of the largest of these, Sierra Nevada and New Belgium, have now built breweries on the East Coast to compliment their original Western breweries. Sierra Nevada in particular is constantly doing very advanced research and R&D that rivals that of some of the now defunct national brewers. So, in a way, brewing has come full circle, from the multitude of small local breweries to the national breweries and back to the local brewer in town with the difference being that these breweries now produce every style in the world as well as new styles developed within the craft industry. At the Great American Beer Festival, beers are judged in over 80 categories when just 40 years ago 4 or 5 styles constituted almost all of the beer in the United States. In fact, as the craft movement continues to swell and slowly eats away at the barrelage of the mainstream brewers, these brewers have also started producing craft style beers or buying out craft breweries.

The success of the craft movement has also not gone unnoticed around the world and has led the way to the development of small breweries producing specialty beers in Canada, Japan, Australia, and even in the countries from whence many of these styles first originated like the U.K., Ireland and Germany.

I would never have predicted in 1975 what has happened today but it seems that the polar opposites of both the continued growth of the large global brewers and the rise of the local specialty brewer will continue for the foreseeable future.

Alan Kornhauser
Brewmaster

Acknowledgments

This edited volume is a culmination of exceptional work and determination from many individuals throughout the world. As such, we would like to recognize and thank those who were most instrumental in helping us see this volume from its inception through its completion.

We would first like to thank all of the authors for contributing their knowledge on various topics related to the geography of beer. Their expertise and professionalism were bar none, and we appreciate their ability to take what they know and to conform it into chapters that fit the overarching theme and writing style of this volume, especially given the short deadlines and sometimes extensive revisions. Additional thanks goes to all the anonymous reviewers whose comments improved the overall cohesion of the book, and allowed the authors to expand their writings and discover the "geographies" of their work.

We believe that geography is distinctive from other disciplines because of its inherent spatial emphasis. As many of the authors are not trained geographers, we worked with a couple very important individuals who helped incorporate the "geography" into the chapters to showcase the spatial findings. Specifically, we wish to thank Michael D. Vest, our cartographer, who created many of the maps that are arguably works of art, and Rebecca Mattord, our student assistant, who helped us with many facets of this book, and who interpreted our underlying vision with the creation of the notable figure found in the introduction chapter of this volume.

Without reserve, we wish to thank Dr. Robert K. Doe, our Publishing Editor, and his universal support and excitement for this project. The idea of this book originated from a discussion during an annual meeting of the Association of American Geographers. While there is still debate regarding which editor came up with the original idea, Robert has never failed in championing this project and has provided patience, enthusiasm and advocacy to bring this volume from a concept to a reality.

We wish to thank all the other members of the publishing team, including Naomi Portnoy, our project coordinator, who kept us on task and provided timely answers to our many questions, as well as Ms. Neelu Sahu, our Project Manager at Crest Premedia Solutions, for proofing the texts and compiling the chapters into the final product.

Additionally, we wish to thank the 2013 Beeronomics Conference and its associated members (including the world's second most interesting man) for educating us on the science, economics, geography and taste of the many types, styles and varieties of beer.

Finally, thanks to all the brewmasters with whom we talked while conducting research. Thank you for sharing your knowledge, passion, experience and of course, your beer. This book is dedicated to the geographers of beer.

Water, barley, yeast
Add some hops to make bitter
Brewing is spatial

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Contributors

Samuel A. Batzli Space Science & Engineering Center, University of Wisconsin-Madison, Madison, WI, USA

Edward Beatty Department of History, University of Notre Dame, Notre Dame, IN, USA

Andrew Comrie School of Geography and Development, University of Arizona, Tucson, AZ, USA

Derrek Eberts Department of Geography, Brandon University, Brandon, MB, Canada

Jay D. Gatrell Bellarmine University, Louisville, KY, USA

Susan M. Gauss Department of History, University at Albany, State University of New York, Albany, NY, USA

Jake E. Haugland Division of Continuing Education and Professional Studies, University of Colorado-Boulder, Boulder, CO, USA

Philip H. Howard Department of Community Sustainability, Michigan State University, East Lansing, MI, USA

Peter A. Kopp Department of History, New Mexico State University, Las Cruces, NM, USA

Rebecca Anna Mattord Department of Geography and Anthropology, Kennesaw State University, Kennesaw, GA, USA

Ralph B. McLaughlin Department of Urban and Regional Planning, San José State University, San Jose, CA, USA

Roger Mittag School of Hospitality, Recreation & Tourism, Humber College Institute of Technology and Advanced Learning, Toronto, ON, Canada

Michael S. Moore Urban Affairs Center and Department of Geography and Planning, University of Toledo, Toledo, OH, USA

Max Nelson Languages, Literatures, and Cultures Department, University of Windsor, Windsor, ON, Canada

David J. Nemeth Department of Geography and Planning, University of Toledo, Toledo, OH, USA

Mark W. Patterson Department of Geography and Anthropology, Kennesaw State University, Kennesaw, GA, USA

Ate Poorthuis Department of Geography, University of Kentucky, Lexington, KY, USA

Nancy Hoalst-Pullen Department of Geography and Anthropology, Kennesaw State University, Kennesaw, GA, USA

Joseph F. Reese Geosciences Department, Edinboro University, Edinboro, PA, USA

Neil Reid Urban Affairs Center and Department of Geography and Planning, University of Toledo, Toledo, OH, USA

Steven M. Schnell Department of Geography, Kutztown University, Kutztown, PA, USA

Steven L. Sewell College of the Mainland, Texas City, TX, USA

Andrew Shears Department of Geography and Geology, Mansfield University, Mansfield, PA, USA

Michael D. Vest Department of Geography and Anthropology, Kennesaw State University, Kennesaw, GA, USA

Charles D. Yeager Missouri Southern State University, Joplin, MO, USA

Stephen Yool School of Geography and Development, University of Arizona, Tucson, AZ, USA

Matthew Zook Department of Geography, University of Kentucky, Lexington, KY, USA

About the Editors

Mark Patterson is a Professor of Geography and Coordinator of the Environmental Analysis and Sustainability program at Kennesaw State University. He earned his Ph.D. in Geography from the University of Arizona. Mark has (co)authored publications on geospatial technology applications for environmental management. Mark's favorite beer style is a chocolate stout.

Nancy Hoalst-Pullen is an Associate Professor of Geography and the Geographic Information Science Director at Kennesaw State University. She obtained a Ph.D. in Geography from the University of Colorado at Boulder. She is the Associate Editor of the Journal of Applied Geography, and has co-edited (with Mark W. Patterson) a volume entitled Geotechnologies in Environmental Management (2010). Nancy has authored and co-authored several publications on such topics as [sub]urban forest dynamics, environmental perceptions of Latin Americans, and forestry management (Chile). Nancy's favorite beer is a Bavarian style hefe weissbier, served at room temperature.

Geographies of Beer

1

Mark W. Patterson and Nancy Hoalst-Pullen

Abstract

Beer is the third most widely consumed beverage, after water and tea (Nelson, The Barbarian's beverage: a history of beer in ancient Europe. Abingdon, Routledge, 2005, p. 1). While four basic ingredients that create beer, namely water, grain, hops and yeast, make it seem like a simple beverage, the complexities rival (and perhaps outcompete) that of wine. Beer encompasses different types (e.g. ales and lagers), styles (e.g. amber ale, barley wine, Hefeweizen, IPA, pilsner, stout) and varieties of styles. To date, the Brewers Association has classified more than 140 different styles of beer (Brewers Association, 2012). Even the most discerning palette would be hard pressed to differentiate that many styles and varieties of ales and lagers. So how can such a simple beverage be so complex? In a word—geography.

Introduction

Beer is the third most widely consumed beverage, after water and tea (Nelson 2005). While four basic ingredients that create beer, namely water, grain, hops and yeast, make it seem like a simple beverage, the complexities rival (and perhaps outcompete) that of wine. Beer encompasses different types (e.g. ales and lagers), styles (e.g. amber ale, barley wine, Hefeweizen, IPA, pilsner, stout) and varieties of styles. To date, the Brewers Association has classified more than 140 different styles of beer (Brewers Association 2012). Even the most discerning palette would be hard pressed to differentiate that many styles and varieties of ales and lagers. So how can such a simple beverage be so complex? In a word—geography.

Geography dictates not only the sourcing of beer ingredients, but the production and distribution of beers. Like grapes for wine, beer is geographical in terms of ingredients. Different tastes come from the grain and hop varieties used. To some extent, the different regions where varieties of barley (or other grains used in making malt) and hops are grown (soil and climate) in turn produce subtle differences in character of the beer. Water and its mineral content also play significant roles on how the beer tastes—from the flavor of the extracted wort to the bitterness of the hops to the overall character of the finished beer (Smith 2012). Even different strains of yeast from different regions of the world affect the flavor of beer.

The production of beer, particularly craft beers, is partially dependent on the ingredients but more so the brewers and localism (or regionalism) of beer style varieties. For example, beers from the Pacific Northwest enjoy hoppy notes (as this is where hops are grown), while the brewers in the Northeast prefer English ales and porters. This is not to say that brewers in the Northeast cannot produce a hoppy beer, or that brewers in the Pacific Northwest cannot produce a great malty beer, but preferences with the region may be evident due to synergetic relationships with a region's history, the role of neo-localism (coined by Flack (1997) as the movement of people to restore the spatial uniqueness and quality of place), and the innovative nature of local brewmasters.

M. W. Patterson (✉) · N. Hoalst-Pullen
Department of Geography and Anthropology, Kennesaw State University, 1000 Chastain Road,
Kennesaw, GA, 30144, USA
e-mail: mpatters@kennesaw.edu

N. Hoalst-Pullen
e-mail: npullen@kennesaw.edu

M. Patterson, N. Hoalst-Pullen (eds.), *The Geography of Beer*, DOI 10.1007/978-94-007-7787-3_1,
© Springer Science+Business Media Dordrecht 2014

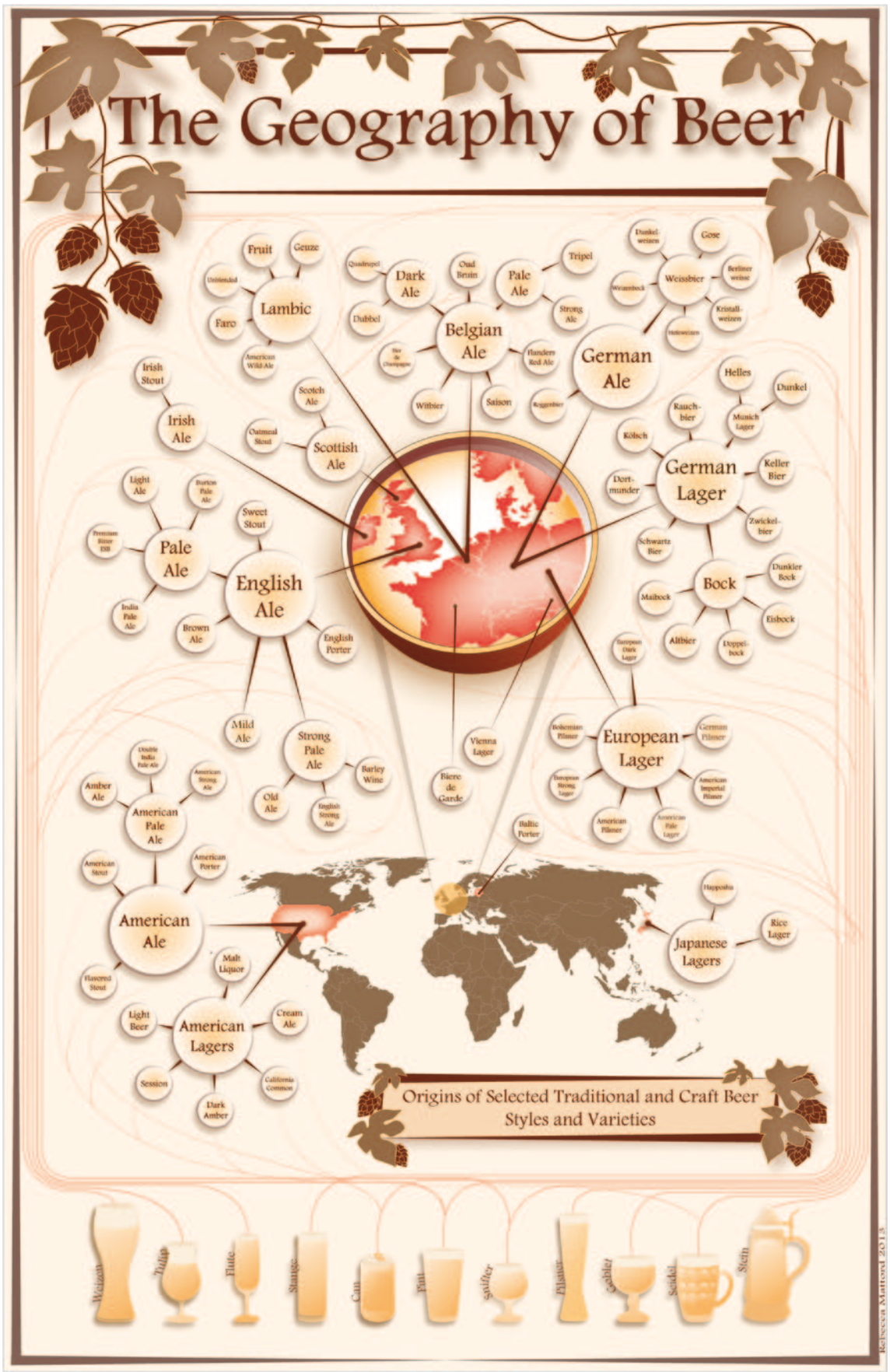

Fig. 1.1 The geography of beer: origins of selected traditional and craft beer styles and varieties

Distribution is also determined by the type and style of beer. While large breweries have national and international distributions of beer types and styles, particularly American-style lagers, small craft breweries tend to distribute locally, to communities near to where the beer is produced. Moreover, beer production in Europe is tied directly to the region of origin, and many beers are named such (e.g. Budweiser, Pilsner, Lambic, Belgian ale etc.) As such, relationships of beer styles and brands grow up and around various regions, garnering support from its local community. Indeed, beer is an integral part of many regions, environments, and societies.

Figure 1.1 showcases the geography of beer explicitly by mapping the origins of selected beer styles and varieties. Admittedly, we had to leave off several beer styles owing to page limitations; however, this figure gives the reader a visual overview of the geographic origins of many common beer styles. Indeed, there is a geography to beer.

While this volume is titled The Geography of Beer (singular), this chapter is entitled Geographies of Beer (plural). There are many geographies of beer, each with its own story waiting to be told. In the following chapters, you will note that geographers are not the only storytellers of beer; anthropologists, historians, sociologists and even linguists tell their geography of beer stories. In all cases, however, the influence of geography on the sourcing, production and/or distribution of beer in terms of regions, environment and societies at local to global scales becomes readily apparent. Thus, we present to you a series of chapters that capture aspects of the many geographies of beer.

Structure of the Volume

This volume is divided into three sections—regions, environment, and societies. While we could argue over the placement of chapters into particular sections, we acknowledge the sections are not mutually exclusive. The astute reader will find varying levels of overlap in citations among chapters, including some authors citing other authors and chapters within this volume.

Regions of Beer

While the topics in this section are varied and incorporate aspects of geography, history, and the like, the unifying theme is the role of place (region) regarding the sourcing, production, and/or distribution of beer. To begin, Nelson's chapter examines beer in Europe spanning a 2,000 year period from 1000 BC to 1000 AD. With detailed analysis of archeological findings and ancient writings, Nelson provides examples on how a variety of cereals and additives were used in the production of beer and were strongly connected to location. The next chapter, by Sewell, provides an overview of the diffusion of beer from Fertile Crescent to present conditions. He touches on the importance of the role of Catholic monasteries in Europe, as well as German immigrants to the New World in helping to diffuse (and popularize) beer.

The next three chapters focus on the geography of beer in North America. In Chap. 4, Batzli focuses on development of United States' brewing from colonial times to the present. By examining data on United States' breweries, Batzli creates a times series of six maps, with each map showing the geographic expansion and contraction of beer brewing since 1612. He provides a discussion on why these historical (and contemporary) spatial patterns exist. Next, Shears narrows the geographic focus to Wisconsin in Chap. 5, as he traces the development of the beer industry in this state. He looks at key geographic concepts such as transportation and economies of scale in his discussion and concludes that successful brewers were those who focused on developing local markets. Gauss and Beatty turn our attention to Mexico, the world's largest exporter of beer. From as far back as the 1850s, geography has played a role in beer production in Mexico. They investigate the geography of Mexican beer by way of the location and spatial interrelationships of industrialization, access to inputs, and urbanization.

In the last chapter in this section, Mittag provides a good introduction to how geography has played a role in the naming of certain varieties and styles of beer. Familiar varieties and styles such as Kölsch, Lambic, Pilsner and California common are named after their places of origin. Additionally, these places tend to be located between the 40th and 50th parallels of latitude, where the climate and soils are more conducive to growing ingredients necessary for brewing beer.

Environment of Beer

The role of environment, particularly in terms of beer's four key ingredients, frames the overarching theme of this section. To start, Kopp's chapter examines hops from an agricultural perspective and its multi-century migration from Europe to North America and throughout the world. While hops have been important to beer making in Europe for over a thousand years, they grew under specific climates and in certain soil types. As plant varieties adapted to other regional climate and soil characteristics, the flavoring characteristics changed. As hops originally came to the New World as part of the Columbian Exchange, cultivation produced new varieties of hops, most notably those in the Pacific Northwest. Today, hops are grown worldwide, including China, a largely untapped market for beer. From a geographic perspective, the production of hops is a good example of global diffusion based on soil and climate regimes.

While water quality has always been critical in the brewing process, Gatrell et al. explore the concepts of hydrogeography and geo-psychology, and investigate how water-based iconography is used by breweries to market beer. Prior to advances in water chemistry, brewers were largely dependent on the natural quality of water used in their beer. Today, brewers manipulate water chemistry to produce more exacting water quality for beer styles and varieties. Yet, despite the adulteration of water (e.g. adding gypsum to accentuate the hop bitterness), many craft brewers use the "purity" of their water as a geo-psychological marketing tool.

Next, Yool and Comrie discuss various styles of beer and the impact the physical environment has on the flavor of the beer. They explore the *terroir* of beer (the influences of the environment on taste) by sampling various craft beers. They speculate how climate change could impact the sourcing (ingredients) of beer, and suggest a potential compression of hop growing regions.

Finally, Hoalst-Pullen et al. examine sustainability in the craft beer industry. They surveyed regional craft breweries to solicit attitudes in the industry with respect to sustainable goals and practices. They found many of these breweries incorporate practices that promote environmental, economic and social sustainability, but unlike large breweries, few conduct carbon footprint audits.

Societies of Beer

The final section of the volume is on the relationships societies have with beer. Just as societies are multifaceted, so too is this section, with topics ranging from economics to social media. To begin, Haugland describes the relationship of water chemistry and colonization with the development and popularization of India Pale Ale (IPA). Haugland recounts the geographic journey of IPA, with its humble beginnings in England, its migration to India, and its new popularity in the United States.

McLaughlin et al. undertake a spatial analysis of craft brewing in the United States. They juxtapose the situation of United States' beer production and consumption; namely, how the consumption of beer per capita in 2011 is at its lowest level, yet the number of breweries during the same year is near an all-time high. To make sense of this paradox, they adopt a three pronged approach. First, they analyze the temporal changes in the number of brewing establishments. Second, they examine craft beer production trends. Third, they map the locations of craft beer establishments to explore the spatial and temporal patterns.

In the next chapter, Howard examines the growth and development of the beer industry from a global perspective. He identifies two significant trends in the global beer industry, viz. consolidation of companies and expansion into new markets by larger firms. Currently, four companies control roughly 50 % of the global beer market. These firms primarily produce pale or American-style lagers, but have recently been brewing other varieties to increase their market share. Howard concludes that these trends are being countered by the growth in the craft beer market and cultural barriers (e.g. brand loyalty) to marketing.

Schnell and Reese (re)introduce the concept of neo-localism, which they define as the "active, conscious creation and maintenance of attachment to place." (Schell and Reese 2003). They argue through naming and imagery, breweries create a psychological attachment to a place, which can serve as a powerful marketing tool and reinforce brand loyalty. Images of clear mountain streams, urban landmarks and other regional iconography have been used to foster loyalty to local beers. While this is especially true of craft breweries (some of whom have been quite successful), larger firms have had mixed results through their creation of faux microbreweries and their attempts to (re)create neo-localism. The authors conclude that the single most important factor impacting loyalty is connection to the community where the beer is brewed.

Eberts also examines neo-localism, but from a Canadian context. He starts by tracing the history of brewing in Canada, noting consolidation was prevalent in Canada (akin to consolidation in the United States). However, microbrewing started to grow in the mid-1980s, with small firms utilizing neo-localism strategies to market their beer. He finds one distinct example, which he calls the bastardization of neo-localism, in which a particular firm stretches neo-localism to its limits through its marketing claims, yet finds little evidence linking the beer brand to place.

In the last chapter of this section, Zook and Poorthuis use data from social media to create maps which show "beer space". Using geo-coded tweets, they make a series of beer space maps, including a comparison of "wine space" and "beer space" to provide a cultural/geographic reference, beer maps highlighting the spatiality of light beer, and finally, maps depicting the regional geography of "cheap" beer. Their work shows underlying geographies of beer that are captured by social media which in turn reflect the social geographies of beer in the real world.

Raising Our Glass

Clearly, geography has had and will continue to play a prominent role in beer production and consumption. Like wine, beer has a regionalism, a distinct taste, a terrior, based not

only on its ingredients, but the traditions and innovations of the brewmasters. Regionalism is also readily apparent in the appellations of beer. As cultures migrated to new locations, they brought with them the recipes, ingredients and knowledge of beer, and sometimes the beer itself (albeit in limited quantities).

As transportation infrastructure grew, so too did the ability to ship ingredients further (water being the notable exception). Likewise, the natural preserving abilities of hops allowed beer to be transported to other continents. With the development of transportation infrastructure and the advent of refrigeration, lagers quickly spread across America as the dominant beer type. By the 1980s, globalization was firmly entrenched in the beer industry, and few styles were readily available to consumers. However, the consolidation of the industry left a vacuum for the modern craft beer movement. Since the 1980s, microbreweries, brewpubs, and even nanobrewies by home brewers have stepped in to fill the niche.

Regardless of the scale at which beer is made, geography is clearly inherent in each stage in the life of beer. Join us as we toast geography and its marvelous impact on beer—Cheers, 干杯, Na zdraví, Skål, Proost, Santé, Prost, Sláinte, Salute, and Salud!

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Part I

Regions

The Geography of Beer in Europe from 1000 BC to AD 1000

2

Max Nelson

Abstract

Today there is a great proliferation of beer styles, most of which were developed in Europe in the modern era, but some evidence exists for a simpler geography of beer in ancient Europe. Barley was the common cereal used by beer-makers (those outside of southern Italy and Greece), while wheat was also used in much of western Europe as a secondary cereal while millet instead was used in the east. Although many types of plant additives were no doubt used in beer, two main ones became popular: sweet gale, first attested in the region of the Rhine estuary around the first century BC, and hops, first widely popularized in the Ile de France area in the ninth AD. Honey too was often used in beer throughout western Europe, except perhaps for the Iberian peninsula and Ireland. It must be stressed that this picture is based on highly fragmentary evidence, and it may be incorrect in many particulars. It may be hoped that future archaeological discoveries will add much to our knowledge.

Introduction

Today there is a great proliferation of beer styles, which are differentiated by the nature and proportions of the water, yeasts, cereals, hops, and other additives used in them, and sometimes also the special techniques employed to produce, store, or serve them. Thus, some beers are fermented with yeasts to make them lagers and some to be ales; some are low in alcohol and some quite high; some are made of lightly roasted barley while others use heavily roasted barley and even include wheat or other cereals; some include hops only as a preservative while others rely on a prominent hoppy flavor; some have added fruit, honey, herbs, or spices; and some are stored in whiskey barrels. In general beer styles are the result of a long tradition of experimentation in a specific region, such as Belgian saison, French bière de garde, Irish stout, British brown ale, Baltic porter, Finnish sahti, Czech pilsner, German kölsch, and Italian chestnut beer (an up to date guide to these modern styles with many maps is Webb and Beaumont 2012; see also Mittag in this volume). Most of these regional styles developed in the modern era, but some evidence exists for a simpler geography of beer in ancient Europe, which is the subject of this chapter. No one has as yet attempted a comprehensive geography of beer for ancient Europe; on the other hand, different historical geographies of intoxicants in general have been proposed.

Historical Geographies of Intoxicants

Sherratt (1995, p. 32), presenting a "geography of intoxication", suggested that at some time in prehistory alcohol displaced narcotics which were inhaled as smoke by those living in the temperate zone of Mesopotamia and the Mediterranean, while those living in steppe regions and especially desert areas continued the earlier practice. He further argued that fruits, especially grapes, were fermented to produce alcohol in southern Europe and that this influenced the fermentation of honey and cereals among more northern Europeans who did not have viticulture (pp. 25–26).

Such a north/south Europe formulation has been common in much scholarship though it has been presented in a number of different ways. Thus Wayens, Van den Steen, and Ronveaux (2002, pp. 93–94) in their attempt at a "short historical geography of beer" proposed that there developed

M. Nelson (✉)
Languages, Literatures, and Cultures Department, University of Windsor, 401 Sunset Ave., Windsor, Ontario N9B 3P4, Canada
e-mail: mnelson@uwindsor.ca

M. Patterson, N. Hoalst-Pullen (eds.), *The Geography of Beer*, DOI 10.1007/978-94-007-7787-3_2,
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two drinking traditions in Europe which became established by the Middle Ages and which survive to some extent today, with beer-drinking in the north and wine-drinking in the south. The authors explained this as being due at least in part to climatic conditions and the evolution of agriculture though they admitted that "climate determinism … does not … justify the weight of beer in Northern Europe". Presumably the authors meant that the climate does not explain the lack of beer in southern Europe since cereals, the main ingredient for beer, did grow there. The authors, however, gave no suggestion as to why purportedly there was no beer in southern Europe.

Engs (1995, pp. 228–229) put forward a more nuanced theory of a modern pattern in Europe, which had its roots in ancient times, which consists of beer-drinking in Scandinavia, the Netherlands, Britain, and northern and eastern Germany, wine-drinking in Italy, Spain, Portugal, southern France, and Greece, and a blend of both beer-drinking and wine-drinking in areas between these zones, including northern France, southwestern Germany, Belgium, Austria, and Switzerland. Engs explained that this has been "due to the ecosystem, seasonal variation and socio-political structures" (p. 228) and she contended that the lack of beer in the south was caused by deforestation dating already from "early antiquity" since wood was required to brew beer (p. 231).

Such north/south theories, however, are misleading and somewhat outdated. In the less than 20 years since Engs' study, the situation in Europe has changed. Having analyzed 1997 to 1999 Food and Agriculture Organization statistics, Grigg showed beer consumption was on the increase, and as expected beer predominated in northern Europe and wine in southern Europe (2004, pp. 101, 104–106). However, more recently, beer-drinking has been on the increase while wine-drinking has been on the decrease in southern and eastern Europe as a whole, and at the same time beer-drinking has been on the decrease in northern and central Europe, leading it would seem to a homogenization of European drinking traditions (Marques-Vidal 2009, p. 138; Colen and Swinnen 2011, pp. 131–132; Herrick 2011, p. 147). Beer in fact is quite a popular beverage today in southern Europe (Medina 2011, pp. 73–75) and there has been a veritable craft brewing revolution in Italy (Webb and Beaumont 2012, pp. 158–163). As pointed out in the latest World Health Organization study of global drinking patterns (2011, p. 6): "Today, in Spain the most consumed alcoholic beverage in litres of pure alcohol is beer, while in Sweden, it is wine." Sigaut (1997, p. 82) had already pointed out that while beer remains emblematic of northern Europe and wine of southern Europe there exists today a more or less universal geography of beer.

More importantly for the present study, not only do the north/south theories inaccurately reflect actual contemporary patterns of consumption in Europe, but they misrepresent and simplify ancient ones as well. Thus before the Middle Ages there was certainly beer-drinking at some points in time in what is now Portugal, Spain, southern France, northern Italy, and parts of Greece. Also, to respond to Engs' conclusion that southern Europeans did not brew because of a lack of firewood, recent research has shown that while deforestation in ancient Greece, for instance, was at times a problem, forests did regenerate, and there remained for the most part a ready supply of wood (Thommen 2012, p. 41), and thus this cannot explain why ancient Greeks did not make and drink beer.

In fact it seems from recently discovered archaeological evidence from various sites in both northern and southern Europe that during the Bronze Age (roughly 3000–1000 BC) alcoholic drinks were typically made by mixing together a number of fermentable products, cultivated or wild, including fruits, cereals, and honey (Sherratt 1995, p. 25; Nelson 2005, p 16. The northern evidence from Denmark and Scotland is surveyed in Koch 2003, pp. 126–132; Nelson 2005, pp. 11–13, with the map at p. 13; McGovern 2009, pp. 137–145. See also Dineley 2004, p. viii for Britain. The southern evidence from Greece is surveyed in Nelson 2005, pp. 13–16; McGovern, Glusker, Exner, and Hall 2008, pp. 202–203; McGovern 2009, pp. 186–187. For Cyprus, see Crewe and Hill 2012 and for Spain, see Garrido-Pena, Rojo-Guerra, García-Martínez de Lagrán, and Tejedor-Rodríguez 2011, pp. 110–111, 114–115). Indeed during this period whichever wild or cultivated product could be fermented probably was, with little thought of producing specific styles of alcoholic drinks. A good example comes from the grave of a young woman in Egtved, southern Jutland, Denmark, dated to between about 1500 and 1300 BC, in which a birch bark bucket was found which contained traces of lime, meadowsweet and white clover pollen, as well as wheat grains, bog myrtle, cowberry, and cranberry, presumably the remains of an interesting mead/beer/wine beverage (Koch 2003, p. 129; Nelson 2005, p. 12; McGovern 2009, pp. 144–145).

It was during the Iron Age (from roughly 1000 BC on) that the production of indiscriminately mixed fermented drinks began to wane, though it did continue on in some places, such as Scandinavia (McGovern 2009, pp. 153–154). This tradition over time gave way to the separate manufacture of wine (made from fruits, especially grapes), beer (made from cereals, especially barley [I use "beer" throughout in its contemporary generic meaning as any alcoholic drink made from fermented cereals]), and mead (made from honey) in different regions of Europe. Wine-making was concentrated in the vine-rich south, among Greeks and later Etruscans and Romans, who spread their technological knowledge throughout Europe, and viticulture came to be practiced as far north as vines could be grown. Beer-making was dominant in much of western, central, and northern Europe among Celtic and Germanic peoples as well as others. By the tenth century AD, Gaul (roughly modern France)

came to be more associated with wine and Germany with beer (Nelson 2005, p. 81), as remains the situation today. On the other hand, beer had never been normally drunk by Greeks or by Romans in Italy (though it was found in other locations within the Roman empire) since they considered it a "cold" and "wet" substance which was unmanly and which was produced from rotten cereals, and thus inferior to "hot" and "dry" as well as manly wine made from grapes (Nelson 2001, pp. 101, 103–104, 2005, pp. 33–37, forthcoming). Finally, mead-making seems to have been most prominent in the north (the evidence from Germany is surveyed in Koch 2003, pp. 132–135), though honey continued to be used in wine by Romans and in beer by Celts. Mead may have been the only beverage in the most northern reaches of Scandinavia until well into the Middle Ages; at least in the late ninth century AD, the common people of "Estland" (likely on the Baltic Sea) were said to drink mead and not to have beer (Old English Orosius, 1.1 in Bately 1980, p. 17).

This chapter will concentrate only on beer in Europe from the period from 1000 BC, when distinct alcoholic beverages came to be created, to AD 1000, by which time hopped beer as is common today had begun to be popular. Although it has been suggested that beer-making came to Europe from the east (see, for instance, the map in McGovern 2009, pp. 132–133, as well as Sewell in this volume), an independent native European brewing tradition uninfluenced from the outside is here presumed and thus non-European evidence will be ignored.

Towards an Ancient European Geography of Beer

Since beer-making was mainly a domestic activity in ancient times, beer styles presumably differed from household to household, and regional varieties were distinguished mainly by the ingredients which were obtainable and preferred. Thus, for instance, the locally available water and wild yeast no doubt provided their own specific characteristics to a given brew.

Certainly at least by the Roman period beer-making grew from being a simple domestic chore to becoming a professionalized activity in parts of Europe. Thus beer was produced by professional brewers in some regions, such as Britain, for units in the Roman army; the maltster Optatus and the brewer Atrectus are known to have supplied the military force at Vindolanda around AD 100 (Nelson 2005, pp. 65–66). Surely with this professionalism came the need not only to make beer in large batches but also to produce a somewhat consistent product. There also arose important beer-making centers, such as in the Mosel/Moselle River basin (in what is now Germany, Luxembourg, and France) in the early centuries AD. Thus in Trier, Germany there existed a guild of brewers, among whose members were a certain Fortunatus as well as a woman whose name was probably Hosidia, as known from surviving, fragmentary tombstones; another brewer there, Capurillus, is not explicitly linked to the guild (pp. 56–57, 60–63). Not far away upstream along the Mosel/Moselle River in Metz, France, the brewer Julius is attested (p. 60). These brewers of the Mosel/Moselle basin probably developed their own particular style, though nothing now is known of it. In the early ninth century AD, Charlemagne provided regulations for brewers working on his imperial estates to ensure their expertise and their attention to cleanliness (p. 99). By that time monastic breweries across western Europe were setting the standard for very large-scale industrial brewing (pp. 100–114). This eventually led to the end of the proliferation of widely divergent individual local styles of beer.

While something is known of where beer in general was brewed and by whom, there is unfortunately little evidence for distinctive production methods in different regions before AD 1000 whether in individual households or larger commercial or industrial enterprises. One of the most explicit ancient sources, the Roman author Pliny the Elder, writing in the first century AD, said only that the peoples of Gaul and Hispania (roughly modern France and Spain, respectively) made beer using "various methods" (*pluribus modis*) and that the people of Hispania also aged their beers (14.29.149 in André 1958, p. 72) and that the Gauls had "various types" (*plura genera*) of beer (22.82.164 in André 1970, pp. 79–80), without providing any further details.

Because of the lacunose evidence only two factors can really be used to differentiate broadly the types of beer found in ancient Europe: the base cereals and the additives used to make beers. Before examining in detail the beer varieties, it is worth looking at the evidence which exists for them, which is both written and material, and to consider its problematic nature.

The earliest extant ancient European written sources about beer were authored by non-beer drinkers (Greeks and Romans) about outsiders, and thus they are potentially misinformed or biased. Even when the beer-drinkers themselves were writing about their own beverage by late antique times and the early Middle Ages (such as in Old Welsh, Old Irish, Old English, and Old Norse works), their accounts are often vague and incomplete. In fact, usually beer is mentioned in written sources only in generic terms, with no breakdown of type or ingredients (such references will be passed over here, but can be found collected in Nelson 2005). When authors do differentiate beers they do so mainly by the cereals used to make them, though sometimes they also speak of additives. Even these mentions, however, are often difficult to place in any sort of concrete temporal or geographical context. Thus, for instance, in the first century AD the Greek medical author Rufus of Ephesus (in what is now Turkey, just outside

Europe) mentioned beer made with dates as being bad for the stomach in a short passage which now survives only in an Arabic translation in a work by a Persian physician from over 800 years later (fr. 197.1 in Al-Rāzī, *Kitāb al-ḥāwī* 11.1 in Daremberg and Ruelle 1879, p. 481; neglected in Nelson 2005). It is impossible to know now whether Rufus himself was indebted to a much earlier source, was speaking from personal experience, or was thinking of date beer as a common drink or a special medical concoction (as found in other sources, as shown in Nelson 2005, p. 73); therefore, it cannot be determined from his testimony where date beer was drunk in ancient times.

On the other hand, the material evidence, as known through archaeological finds, is securely tied to a specific place, and also often can be pinpointed to an exact time period, yet it is sometimes as ambiguous or difficult to interpret as the written evidence (for a survey of the type of material evidence which exists for beer from ancient times, see Stika 2011, pp. 56–58). Some of this evidence, like what is found in the written sources, is also generic; that is, it points to the probability of beer-making or drinking in a certain location, but without any way to determine the specific type of beer involved. Thus tools and vessels used in the production, storage, and consumption of beer, the residue of beer itself (such as in the form of calcium oxalate or "beerstone"), and the archaeological remains of breweries all indicate the presence of the beverage, but this sort of material evidence usually can tell us nothing about types of beer. On the other hand, finds of ingredients for beer help to provide a picture of beer varieties. Finds of cereals or cereal pollen by themselves cannot be tied to beer-making any more than to bread-making, but finds of malted cereal can more tentatively be connected to beer (van Zeist 1991, pp. 119–120; Stika 2011, p. 56). Cereals must be malted (that is germinated by being moistened and then heated and dried and possibly roasted) before proper fermentation to allow the starch in cereal to be converted to sugars which yeast can then transform into alcohol and carbonation (to put it simply). Cereal can accidentally germinate by being present in wet fields or in damp storage places, and thus only deliberate germination should be considered to point to beer-making; however, malted cereal could be used to make bread too as was common among Greeks and Romans (André 1961, pp. 57–58) or can be eaten on its own. Thus in a number of sites throughout Britain driers with charred grain, mainly wheat, dating especially from the third and fourth centuries AD, have been discovered which may point to malting for beer production (for instance, van der Veen 1989; Cool 2006, p. 141, n. 59; Parks 2012), but need not. The same interpretative problem arises with beer additives as well. For example, in Graveney in England a find of hundreds of hop flowers dated to the tenth century AD was discovered in the context of a boat rather than a brewery (Nelson 2005, p. 112), and thus it is impossible to know certainly whether they were meant to be used in beer. It is only when malted cereals and a typical beer additive (such as hops) are found together, or in the context of a likely brewery (with, for instance, a space for heating the mash, that is the mixture of ground malt and water), that the former presence of beer at the location becomes much more certain.

Since all of the evidence, both the written and the material, is highly fragmentary it is impossible to make any sort of certain pronouncements on the exact geography of beer in ancient Europe. In fact, since it is necessary often to extrapolate from a single source for an entire region over a long period of time, all conclusions must be considered highly tentative.

Cereals Used in Beer

The cereal or combination of cereals from which a beer is made is one of the most essential parts of its composition. Barley is the most common cereal used in the making of beer today and the same was the case in ancient Europe. Where beer was made, barley was usually the base ingredient; yet, almost all places that had barley beer also had a secondary beer made either of wheat (particularly in western Europe) or millet (only in eastern Europe) (see Fig. 2.1; the map is synchronic, and thus does not show possible changes over time). There are some areas (such as Ireland and Scandinavia) where barley beer was present for which there is no secure evidence as to whether there was wheat or millet beer. However, since wheat existed in these regions, wheat beer may well have been made there as well. It is also possible that yet other cereals, such as rye or oats, were used in the making of beer in ancient Europe as well but the evidence for these is too indeterminate and will generally be passed over. None of the written evidence helps to show indubitably whether cereals were ever combined in one beer in ancient Europe. However, some of the archaeological evidence points to this. For example, malted spelt wheat and barley, perhaps meant for beer-making, were found together in a deposit in Colchester, England at the ratio of ten to one (Cool 2006, pp. 141–142) and the pollens of barley along with wheat, millet, and rye were found together in a bronze container in a grave in Verucchio, Italy which may once have contained beer (Marchesini and Marvelli 2002, pp. 301–305). It may be that many ancient cereal fields contained a mixture of various species which may have been often indiscriminately malted together to make beer.

Only the written and material evidence which explicitly and unambiguously indicates the cereal from which beer was used is here presented. The terms employed for types of beer (in Greek or Latin or else in Celtic or Germanic languages), which can sometimes indicate the cereal used in beer (see Nelson 2001, pp. 19–94), will be passed over since this type

Fig. 2.1 The probable distribution of beers by cereals used in the production process (1000 BC–1000 AD)

of evidence does not provide additional information regarding the distribution of beer styles in ancient Europe.

Barley

Barley, both two-row (*Hordeum distichum* L.) and six-row (*Hordeum hexastichum* L.), was widely cultivated in ancient Europe and could readily be malted to make beer (Nelson 2001, pp. 106–107; see Schwarz and Li 2011 for the present day use of barley in brewing). Barley beer was no doubt the type which was most widely produced and drunk in ancient Europe, as evidenced from both the written and the material evidence (see Table 2.1, in which the evidence is presented in chronological order).

Greeks from the seventh to the fifth century BC spoke of the barley beer of their neighbors in Thrace and Paeonia (roughly modern Bulgaria and Macedonia, respectively) in the northeastern Balkans. Later, as the Romans spread out of Italy, authors from the second century BC on spoke of barley beer among the peoples in what is now Spain (where a king drank it from silver and gold bowls), France, and Germany, as well as in the Italian Alps, the northwestern Balkans, and (roughly speaking) in Ukraine and Russia. Also in the first century BC beer was drunk in what is now Portugal among Lusitanians when feasting with kinfolk (Posidonius, fr. 22 in Strabo, 3.3.7 in Theiler 1982, p. 40); although the type is not known, it probably was made from barley. Furthermore, beer made from barley malt is attested in Ireland from a law from around AD 700 (discussed in Binchy 1982). Additionally, an Old Irish poem, dated to around AD 1000 in its present form, mentions the beers in various Irish and British kingdoms including the bitter beers of the Saxons and the beers red like wine around Geirgin (*Scéla Cano meic Gartnáin* 450–485 in Binchy 1963, pp. 17–18), which may refer to an Irish settlement in what is now Scotland (Binchy 1963, pp. xxvii, 38). Many other ancient Irish sources mention red beer, which may have been produced with a specially roasted barley (as is the case today with Irish-style red ale, for which, see Griffiths 2007, p. 34). Thus a source no earlier probably than the ninth century A.D. mentions that Saint Brigit miraculously turned bathwater into red beer (*Ní car Brigit* 36 in Stokes and Strachan 1903, p. 337). This was certainly thought of as an elite Irish beverage as those who were to be

Table 2.1 Evidence of barley beer in Europe from 1000 BC to AD 1000

Modern locations	Written sources for barley beer	Material finds of malted barley probably for beer
Northeastern Balkans	Archilochus, fr. 42 West (seventh century BC) in Athenaeus, 10.447b (second century AD), who assumes it is barley (Thrace) Hecataeus, fr. 154 (sixth century BC) in Athenaeus, 10.447d (second century AD) (Paeonia) Hellanicus, fr. 66 (fifth century BC) in Athenaeus, 10.447c (second century AD) (Thrace) (all in Olson 2009, pp. 138, 140)	
Germany	Tacitus, *Germania* 23.1 (first century AD) (Germania) (Winterbottom and Ogilvie 1975, p. 49)	Eberdingen-Hochdorf (fifth century BC) (Stika 2011, pp. 58–61)
France	Posidonius, fr. 169 (first century BC) in Diodorus Siculus, 5.26.2 (first century BC) (Gaul) (Theiler 1982, p. 138) Dionysius of Halicarnassus, 13.11.1 (first century AD) (among Celts) (Jacoby 1967, p. 245)	Roquepertuse (fifth century BC) (Bouby, Boissinot, and Marinval 2011, pp. 355–357)
Spain	Polybius, 34.9.15 (second century BC) (Iberia) (Buettner-Wobst 1963, p. 418)	
Denmark		Østerbølle (first century AD) (van Zeist 1991, pp. 119–120)
Britain		Colchester (first century AD) (Cool 2006, pp. 141–142, 176)
Northern Italy	Strabo, 4.6.2 (first century AD) (among Ligurians) (Lasserre 1966, p. 171)	Verucchio (eight century BC) (Marchesini and Marvelli 2002) Pombia (sixth century BC) (Castelletti, Maspero, Motella De Carlo, Pini, and Ravazzi 2001; Gambari 2001, pp. 145–146, 2005)
Northwestern Balkans	Cassius Dio, 49.36.3 (third century AD) (Pannonia) (Cary 1917, p. 414) Ammianus, 26.8.2 (fourth century AD) (Illyricum) (Marié 1984, p. 86)	
Ukraine/Russia	Priscus, fr. 11.2 (fifth century AD) in Constantine Porphyrogenitus, *Excerpta* 3 (tenth century AD) (Scythia) (Blockley 1983, p. 260)	
Sweden		Eketorp (sixth century AD) (van Zeist 1991, p. 120)
Ireland	*Cáin Aigillne* 8 (eight century AD) (Thurneysen 1923, p. 348)	

Kings of Tara were said to be symbolically served red beer in a golden cup by a maiden goddess personifying the "Sovereignty of Ireland" in a source perhaps as early as the ninth century AD (*Baile in Scáil* 6, 9, 10, 11, and 14 in Murray 2004, pp. 34–36, 38).

Finds of malted barley, probably for brewing, further demonstrate that barley beer existed in Britain, Denmark, and Sweden. However, both the northern limit and the southern limit of the area where barley beer was available are very difficult to gauge with the presently available evidence. As for the northern limit, there is little doubt that barley beer reached into Norway. At least in the tenth century AD, the Norwegian poet Eyvindr mentioned beer in his poem about King Hákon the Good (*Hákonarmál* 16 in Snorri Sturluson, *Heimskringla* 4.32 in Jónsson 1900, p. 221), who was said, in order to promote Christianity, to have made it a law that if one did not celebrate Christmas with a feast of beer one had to pay a fine (Snorri Sturluson, *Heimskringla* 4.13 in Jónsson 1900, p. 185). The base cereal used for beer at this time does not seem to be specified in any of the surviving sources, but it was probably barley. As for the southern limit, recent finds (neglected in Nelson 2005) from two early Iron Age graves point to the use of beer made of barley (mixed with other cereals) in northern Italy, though there exists no evidence for its use in southern Italy.

Wheat

A variety of naked and hulled types of wheat was known in ancient Europe and it was probably mainly the variety known as emmer, whether hulled (*Triticum dicoccum* Schrank) or naked (*Triticum turgidum* L.), which was most often used to make beer (Nelson 2001, pp. 108–110). The principal areas where wheat beers have been brewed in Europe in modern times have covered a swath from Belgium, through Germany and into Poland (Hieronymus 2010, p. 16), although they are also found in Brittany in France (Webb and Beaumont 2012, p. 132). Production of British wheat beer ceased in the nineteenth century but has been revived since the late 1980s

Table 2.2 Evidence of wheat beer in Europe from 1000 BC to AD 1000

Modern locations	Written sources for wheat beer	Material finds of malted wheat probably for beer
France	Posidonius, fr. 170 (first century BC) in Athenaeus, 4.151e (second century AD) (Gaul)(Theiler 1982, p. 142) Pliny the Elder, 18.12.68 (first century AD) (Gaul) (Le Bonniec and Le Boeuffle 1972, p. 81)	
Britain	Dioscorides, 2.88 (first century AD) (Wellmann 1958, p. 171)	Catsgore (Roman Era) (van Zeist 1991, pp. 119–120) Colchester (first century AD) (Cool 2006, pp. 141–142, 176) Isca (first–second century AD) (van Zeist 1991, pp. 119–120)
Germany	Tacitus, *Germania* 23.1 (first century AD) (Winterbottom and Ogilvie 1975, p. 49)	Bad Dürkheim (Roman Era) (van Zeist 1991, 120)
Spain	Dioscorides, 2.88 (first century AD) (Iberia) (Wellmann 1958, p. 171) Pliny the Elder, 18.12.68 (first century AD) (Hispania) (Le Bonniec and Le Boeuffle 1972, p. 81) Florus, 1.34.12 (second century AD) (Numantia) (Jal 1967, p. 80) Orosius, 5.7.13 (fourth century AD) (Numantia) (Arnaud-Lindet 1991, p. 100)	
Northwestern Balkans	Ammianus, 26.8.2 (fourth century AD) (Illyricum) (Marié 1984, p. 86)	

Table 2.3 Evidence of millet beer in Europe from 1000 BC to AD 1000

	Written sources for millet beer	Material finds of malted millet probably for beer
Northeastern Balkans	Hecataeus, fr. 154 (sixth century BC) in Athenaeus, 10.447d (second century AD) (Paeonia) (Olson 2009, p. 140)	
Northwestern Balkans	Cassius Dio, 49.36.3 (second–third century AD) (Pannonia) (Cary 1917, p. 414)	
Ukraine/Russia	Anonymous Lexicon in *P.Oxy.* XV.1802.ii.42 (second–third century AD) (Scythia) (Grenfell and Hunt 1922, p. 158)	

(Cornell 2010, pp. 153–155; Hieronymus 2010, p. 18). It is clear that in ancient times wheat beer was more widespread in Europe (see Table 2.2, presented in chronological order). Furthermore, modern wheat beers have inevitably been made from a combination of wheat malt and barley malt, while in ancient times they may have been usually made with wheat malt alone.

Greek and Roman authors from the first century BC to the first century AD recognized that wheat beer was consumed in what is now France and Britain. Cool (2006, pp. 141–142) further argued from the archaeological evidence (which is sparse) that barley beer was more prevalent in northern Britain and wheat beer was more common in southern Britain. The inhabitants of what is now Spain also had their own type of wheat beer (see also the later sources for this in Nelson 2001, pp. 47–50). Furthermore, by the first century AD Germanic tribes consumed wheat beer, as is known from written and material evidence. Finally, wheat beer existed in the northwestern Balkans, where it was said in the fourth century AD to be, along with barley beer, a drink of the poor. It may also have been found among the Scythians in roughly what is now Ukraine and Russia, but the evidence is uncertain (Nelson 2005, pp. 43–44); if so, this would be the only region in ancient Europe known to have had separate barley, wheat, and millet beers.

Millet

Millet is not a very hardy cereal and yields a small return, facts which explain why it was not a very popular cereal for food or drink in ancient Europe. It seems that the common variety (*Panicum miliaceum* L.) was the one normally used to make beer (Nelson 2001, pp. 110–111). Millet beer is attested from written sources in the Balkans north of Greece and also among the Scythians (who inhabited what is roughly now Ukraine and Russia) in a period from the sixth century BC to the third century AD (see Table 2.3, presented in chronological order). In the Balkans a beer named *boza* is still made today using any of a number of cereals, though apparently the "best quality and taste is

obtained when millet is used" (Yegin and Fernández-Lahore 2012, p. 535). This may be a direct descendant of the ancient millet beer of the region. That millet was not used for beer in western Europe is implied from the silence of some sources. Thus in the seventh century AD Jonas spoke of beer only made of wheat or barley and placed it in Gaul, Britain, Ireland, and Germany, as well as in the Balkans (*Vita Columbani* 1.16 in Krusch 1905, p. 179). A later eastern European, Byzantine source (Leontinus) knew of beer made from oats and millet, but stated that barbarians especially used wheat and barley for beer (*Geoponica* 7.34.1 in Beckh 1895, pp. 212–213).

Additives Used in Beer

As plain beer (made only with malted cereal, water, and yeast) lacks much flavor, a variety of additives, particularly locally available plants, must have been used to improve its taste since early times (Behre 1999, p. 35; Hornsey 2009, p. 36). Furthermore, some plants were added to beer also because they acted as preservatives (Behre 1999, p. 35; Dineley 2004, p. 13), so that beer did not have to be drunk soon after being made. It can be assumed, however, that until well into the Middle Ages beer mainly continued to be a beverage consumed relatively quickly, thereby establishing it as a local product little imported or exported (though some beer was stored and possibly transported in barrels already by the sixth century AD as shown in Nelson 2005, pp. 49–50, 94-97).

Rather than distinguish ancient European beers by their base cereal, as the surviving ancient Greek and Roman sources did, Behre, in an important article (1999, pp. 35, 36), instead spoke of two main styles of European beers which arose in ancient times, those made with sweet gale and those with hops, and he argued that all beers by the early Middle Ages were either of one type or the other, and that hopped beer over time came to replace sweet gale beer. Behre proposed that other herbs were used but were only of secondary importance (1999, p. 35; for a listing of some of these, see Dineley 2004, pp. 13–18, who places particular emphasis on the use of henbane in beer, and Hagen 2006, pp. 207–208). Only one source, for instance, mentioned fleabane being used in beer (Hecataeus, fr. 154 in Athenaeus, 10.447d in Olson 2009, p. 140). Furthermore, some beer additives may have been purely medicinal. Thus the Old English medical text known as *Lacnunga*, surviving in a manuscript from around AD 1000, described a beer made from wheat malt brewed in a copper kettle with boarfern, bishopwort, hindhealth, pennyroyal, and periwinkle to be drunk to help against coughing (180 in Pollington 2000, p. 242). However, for this chapter, the focus will be only on sweet gale, hops, and also honey, which was clearly also a widespread additive (see Fig. 2.2).

Sweet Gale

Sweet gale, also known as bog myrtle (*Myrica gale* L.), is a shrub which grows naturally along the coasts of northern Europe (Behre 1999, p. 36, Fig. 1; Nelson 2001, pp. 139–140). When placed in beer it provides "a certain sharp, distinctive, and probably potent but still sweet taste" (Unger 2011, p. 49). Some have further distinguished sweet gale beer from hopped beer by claiming that the former is narcotic while the latter is rather sedating (Hornsey 2009, p. 37). No written source before AD 1000 explicitly mentions sweet gale beer but large finds of sweet gale fruitlets, probably used for beer, and dating from the first century BC to the first century AD were found at several sites in the northern Netherlands in the area of the Rhine estuary (Behre 1999, pp. 35, 39, with the map of finds at 37, Fig. 3; Hornsey 2009, p. 38). As early as the tenth century AD in the Netherlands a type of beer made with a variety of herbs came to be known as *gruit* and it is usually assumed that sweet gale was the main ingredient (for instance, by Hornsey 2009, p. 37). However, the exact composition of *gruit* is unknown and sweet gale may not have been the predominant type of herb used in it (Unger 2004, pp. 30–34, 2011, pp. 49, 51). Regardless, there was probably a continuous tradition of using sweet gale in beer in what is now the Netherlands from the Roman period well into the Middle Ages. Sweet gale was probably also used in beer in other places; at least the tenth century AD Old English *Lacnunga* mentions boiling sweet gale among other herbs as well as honey in beer to treat lung disease (59 in Pollington 2000, p. 200). Clearly for some unknown reason hopped beer gradually replaced beer made from sweet gale and other herbs. Such beers died out until they came to be recreated in the late twentieth century by some adventurous brewers (such as the Jopen Koyt gruit made at present in Haarlem in the Netherlands).

Hops

Hops (*Humulus lupulus* L.) are a climbing plant found throughout mainland Europe. Oils from the hops' female flower are now almost universally used in beer-making, providing a bitter taste and acting as preservative, sterilizer, and clarifier (Nelson 2001, pp. 140–144, 2011, p. 77; and see Hieronymus 2012, pp. 176–202 for the modern use of hops in brewing). However, it is unclear exactly when hops were first used in beer. Behre (1999, pp. 39–41, with the map of

Fig. 2. 2 The probable distribution of beers by additives used in the production process (1000 BC-AD 1000)

finds at 38, Fig. 4) showed that hops have been found in archaeological contexts dating to as early as the sixth century AD, but not securely linked to brewing. More recently, however, traces of hops were found with barley in an earthenware vessel placed in a cinerary urn buried in a sixth century BC Celtic grave in Pombia, northern Italy, providing the possibility that hopped beer is much more ancient than once thought (Castelletti, Maspero, Motella De Carlo, Pini, and Ravazzi 2001, p. 107; Gambari 2001, p. 146; Marchesini and Marvelli 2002, p. 305). Whatever the origins of hopped beer there is little doubt that it became widely popularized only by the Middle Ages. In the early ninth century AD a number of monasteries in France are recorded to have had hops, and in some instances, all in the Ile the France area, the hops were explicitly said to be used to make beer (Nelson 2005, pp. 107–109, with the map at 109). In Haithabu in northern Germany in a ninth century AD context there has been found an abundant amount of hop flowers coupled with malt residue, and thus surely for brewing (Behre 1999, p. 39). Also an anonymous Old English herbal from the tenth century AD apparently alluded to using hops in beer (*Herbarium* 68.1 in De Vriend 1984, p. 110). It may be that hopped beer was popularized among monasteries in northern France and spread to various places from there (into the Low Countries, Germany, Britain, and Scandinavia, as traced in part in Unger 2004, pp. 53–106), to eventually become a globally dominant ingredient in beer.

Honey

As was already mentioned above, in ancient Europe honey was fermented on its own to produce mead, but also at times it was combined and fermented together with malted cereal to create a honey beer (or bragget). Honey was useful in many ways as an additive during the production of beer: to increase alcohol strength (through its fermentable sugars); to act as a preservative; to provide yeast to help ferment the

malted cereal; to add a sweet flavor (if not fully attenuated); and potentially to add narcotic qualities from the flowers from the nectar of which the honey was made (Nelson 2001, pp. 131–135). In the fourth century BC the Greek explorer Pytheas visited northern Europe and wrote that among people there who had grain and honey, their beverage had these ingredients too (fr. 7 in Strabo, 4.5.5 in Roseman 1994, p. 134), presumably meaning that they made beer and mead and possibly also honey beer (the passage is ambiguous on this point). In the first century BC the Greek traveler Posidonius (fr. 170 in Athenaeus, 4.152c in Theiler 1982, p. 142) wrote that wealthy Gauls drank wine, the less rich drank wheat beer made with honey, and the masses drank plain beer (presumably made with barley). Perhaps traditionally the wealthy Gauls drank mead rather than wine before it was introduced to them by southerners. The existence of Celtic or Germanic honey beer has been confirmed by archaeological finds. Some one hundred small pots found in a well in Lichterfelde near Berlin and dating to around 1000 BC might have once contained honey beer (Koch 2003, pp. 136–137; McGovern 2009, p. 147). Furthermore, in a Celtic grave in Glauberg, Germany, dating to around 450–400 BC, residue from what may have been honey beer as well as mead has been found (Koch 2003, p. 135; McGovern 2009, p. 152). There is no evidence for honey beer in ancient times in the Iberian peninsula or in Ireland, though it may have existed there too.

Honey beer is also attested in early medieval Britain. The sixth century AD Old Welsh poet Aneirin referred to the honey beer (bragget) found in what is now Edinburgh, Scotland (*Gododdin* 144 in Koch 1997, p. 68). In a penitential falsely attributed to the late seventh century AD Theodore of Tarsus, Archbishop of Canterbury, honey beer is mentioned in passing (1 in Migne 1864, p. 935, and found in various other sources as shown in Nelson 2005, p. 162, n. 43). In the law code of King Ine of Wessex from the late seventh century AD (70 at Liebermann 1903, p. 119) "Welsh ale" and "clear ale" were mentioned, and these two types are found in many later Old English texts, with "Welsh ale" probably referring to honey beer (Breeze 2004; Hagen 2006, pp. 211–213, 230). Interestingly, in the Welsh laws traditionally attributed to the tenth century AD King Hywel the Good, it was said that the King should be provided twice a year by his freemen with a vat of mead large enough that he could bathe in it, or else two vats of bragget or four of beer, thus clearly showing how highly the Welsh prized their honey-based intoxicants (*Dull Dyved* 2.19.3–4 in Owen 1841, p. 532; for other provisions of honey beer, see pp. 44, 64, 196, 198, 362, 390, 392, 534). Cornell (2010, pp. 146, 193) suggested that "Welsh ale" was usually made from wheat malt and honey, with the wheat providing it with a certain hazy appearance which would explain why it was normally contrasted with "clear ale", which was presumably made simply with malted barley. This may well have been the case as honey beer is only attested in places that had wheat beer and the only source before AD 1000 which explicitly indicated which type of cereal was used in honey beer, Posidonius, spoke of wheat. Honey beer seems to have died out during the Middle Ages only to have been revived in the twentieth century in Britain and elsewhere in Europe (Cornell 2010, pp. 194–195).

Conclusion

The surviving evidence for beer in ancient Europe, derived from both written and material sources, is fairly fragmentary and as such does not allow for a detailed picture of regional varieties of beer. However, there is enough extant information to reconstruct some general patterns of beer consumption from 1000 BC to AD 1000.

Scholars have typically emphasized a north/south European division, assuming that beer was only popular in the north. In reality beer was common throughout Europe between 1000 BC and AD 1000 except in what is now southern Italy and Greece. In fact more prominent than a north/south division was a west/east division: while barley was the common cereal used by all beer-makers, wheat was also used in much of western Europe as a secondary cereal while millet instead was used in the east. Scholars who have promulgated the north/south European distinction have attempted to explain it by vaguely referring to climatic, agricultural, and socio-political factors which led to wine being drunk in some areas and beer in others. Some of these factors may in fact have affected the widespread use of barley as well as the prevalence of wheat or millet beer in different regions. No doubt the fact that barley can be grown in a variety of different environments, as well as the ease in malting and fermenting it, led to its general popularity for beer-making. However, it is more difficult to explain why wheat beers prevailed in the west while millet beers prevailed in the east. The reason cannot simply have been a matter of climate or agriculture since wheat was grown in the east as well as the west and millet was grown in the west as well as the east. Clearly simply because a certain cereal was locally available did not mean that it was inevitably used to make beer; this is particularly clear in the case of southern Italy, where there was an abundance of cereal of various types, but apparently no beer was made from it. No doubt then there were cultural factors which led some ancient European peoples to opt not to make beer at all or else to make beer with wheat and not millet, or millet and not wheat. Some, like the Greeks, seem to have viewed every type of cereal, at least as processed in beer, to be an undesirable comestible, perhaps in part due to a pseudo-scientific understanding of fermentation and the nature of beer. It may be speculated that on the other hand Celtic and Germanic peoples may have upheld

wheat as a particularly beneficial cereal in beer while eastern European peoples championed millet instead, each for some now unknown reasons, whether nutritive, religious, or political. Drink choices therefore were not simply determined by geography.

However, the story of beer in ancient Europe is more complicated than a general acceptance of barley beer and further different regional preferences for wheat or millet beer. For one, some beer-makers may well have indiscriminately combined various types of cereals together. Furthermore, many beer-makers certainly added various other ingredients to their beers, to improve the flavor, to act as preservatives, and/or for positive physiological effects. Although many types of plant additives were no doubt used in beer, two main ones became popular: sweet gale first attested in the region of the Rhine estuary around the first century BC, and hops, first found in the sixth century BC but only popularized in the Ile de France area in the ninth century AD. Just as in the case of wheat and millet, which were cultivated widely in both western and eastern Europe but not used in beer throughout this whole area, both sweet gale and hops were found growing in the wild in a much larger region than where they were used in beer. Presumably ancient brewers over generations experimented with locally growing plants and some came to view sweet gale and others hops as particularly effective for their own purposes. This seemingly occurred independently in different places, such as in northern Italy and then later in northern France with regard to hops. However, a single container of hopped beer in a tomb in northern Italy can prove only that one brewer decided once to have recourse to this plant, and need not mean that it was then in wide use. Presumably there were particular impetuses which caused the practices of individual home-brewers of using certain additives to become accepted by a wider community of brewers. For instance, for the sake of mere speculation it could be suggested that sweet gale was first used by a number of independent home-brewers and only came to be widely adopted as a beer ingredient by an interconnected community of brewers in what is now the Netherlands because they had begun to export (on no more than a small scale perhaps) their beers up the Rhine river and needed to preserve them better for the journey. Similarly, when monks in what is now northern France wished to extend the shelf-life of their beers, which they needed in large quantities to supply themselves as well as guests to their monasteries, and even sometimes for outside sale, they came to use hops. Therefore a localized innovation, answering at first the very specialized needs of an individual home-brewer and her household or a particular commercial brewer and his clientele or eventually a larger brewing community, gradually came to be adopted ubiquitously.

Finally, honey was widely used in beer throughout western Europe, no doubt as a simple means to make a better, stronger, and sweeter brew. Honey, which took much work to collect and which was the main available sweetener, was a prestige product, available for only more well-off consumers. Presumably throughout Europe those who had access to honey used it, whether on their usual foods or in their regular drinks, including beer. Apparently in western Europe honey was combined with malted wheat as the two premium beer ingredients. No evidence survives for the existence of honey beer in the Iberian peninsula and Ireland, but presumably this represents simply a gap in our knowledge, since honey was available in these areas and there is no reason to think that it would be avoided by beer-drinkers there.

In conclusion, it must once again be stressed that the picture presented in this chapter is based on highly fragmentary evidence, and it may be incorrect in many particulars. It may be hoped that future archaeological discoveries will add much to our knowledge.

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The Spatial Diffusion of Beer from its Sumerian Origins to Today

3

Steven L. Sewell

Abstract

This chapter traces the spatial diffusion of beer from the Fertile Crescent region and on to Egypt, then throughout Europe via the Roman conquest. The importance of Catholic monasteries to the development of beer culture in Europe during the Middle Ages is reviewed, along with the rise of commercial brewing and the decline of monastic brewing in early modern Europe. This chapter also discuss the dissemination of beer culture to Colonial America and later in the United States. Topics discussed include the role of German immigrants in the development of nineteenth century beer industry. Twentieth Century topics discussed include prohibition, post-World War II mass production and consolidation, and the rise of microbreweries.

Beer in the Ancient World

It's not much of a stretch to state that the discovery of beer led to the rise of civilization. The accidental discovery of beer led mankind to abandon a nomadic lifestyle in favor of an agrarian society in order to have a steady supply of the ingredients needed to produce beer (Standage 2005). This thesis has been advanced by Solomon Katz of the University of Pennsylvania, Charlie Bamforth of the University of California, Davis, and Jonathan Sauer of the University of Wisconsin. This viewpoint challenges the long held supposition that agrarian societies first arose to fulfill the need to produce grain for bread (Katz and Voigt 1986; Martorana 2010; Preet 2005).

There is a clear connection between geography and beer in the ancient world (Fig. 3.1). It is easy to trace the spatial diffusion of beer across the swath of fertile agricultural land stretching from the Zagros Mountains in what today is western Iran, across the Mesopotamian Plain, on to Egypt (Allen 1997). Trade between ancient Egypt and Greece spread beer to the European Peninsula. Greco-Roman trade extended beer to the Roman Empire, where beer culture was disseminated throughout the Roman Empire. While the Romans developed a preference for wine, northern portions of the empire, where wine grapes grew poorly and barley grew well, remained a beer drinking region (Poelmans and Swinnen 2012; Cutler 1996).

Research suggests that beer was discovered by accident in Sumeria around 10,000 BCE when rain-soaked wild barley that had been harvested and collected in jars came into contact with wild yeast and became fermented. Eventually these nomadic peoples settled down to raise domesticated grains (Katz and Voigt 1986). Other references date the discovery of beer to 8,000 BCE when crumbled barley bread, called "bappir," was placed in jars, mixed with water and left in the open where wild yeast floated in and caused fermentation (Shurkin 2012; Eames 1993; Standage 2005).

Regardless of how and when it was discovered, by 6,000 BCE beer was firmly entrenched in Sumerian society. Some of the oldest evidence of the discovery of beer is a 4,000-year-old Sumerian tablet that depicts people drinking beer through straws from a communal bowl. In 1,800 BCE the Sumerian "Hymn to Nankasi" (a prayer to the goddess Ninkasi, the patron goddess of brewing), served as both a prayer and a recipe (Eames 1993; Katz and Voigt 1986). Nearly 4,000 years later, in 1989, the Anchor Brewing Company brewed a beer using this same recipe that included bread, honey and date syrup as ingredients (Hieronymus 2012). The fact that the Sumerians avoided eating the bread they produced except during times of famine is additional evidence that beer, not bread, is

S. L. Sewell (✉)
College of the Mainland, 1200 Amburn Road,
Texas City, TX 77591, USA
e-mail: ssewell@com.edu

M. Patterson, N. Hoalst-Pullen (eds.), *The Geography of Beer*, DOI 10.1007/978-94-007-7787-3_3,
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Fig. 3.1 Cartographic representation of the spatial diffusion of beer culture

the foundation of civilization (Katz and Voigt 1986). The Sumerians weren't the only ancient civilization brewing beer. Around 4,000 BCE small villages developed in Iran along the conjunction of the plains and mountains (Curtis 1996). The area most suitable in the Zargos Mountains for agriculture, hence beer, was the Islamabad Plain. The Islamabad Plain's favorable climate, fertile soils, and plentiful rain made it well suited for agriculture (Abdi 2003). By 3,500 BCE barley beer was being produced in the Zagros Mountains of what today is Iran. In fact, the earliest known chemical evidence of beer comes from this region (Nelson 2005).

With the decline of Sumeria came the rise of the Babylonian empire. The Babylonians inherited much from Sumerian culture, including the art of brewing beer. The Babylonians brewed at least nine types of beer. Babylonian beers included dark beer, golden beer, red beer, and dark beer. Babylonian beer was typically consumed through a straw which helped prevent the husks and other solids in the beer from reaching the consumer (Damerow 2012).

The importance of beer to Babylonian culture was reflected in the fact that beer laws were part of the famous Hammurabi Code. The Hammurabi Code mandated that every Babylonian receive a beer ration, the size of which was based on social status. Workers received a ration of 2 l; civil servants had a daily allotment of 3 l, while administrators and high priests received 5 l per day. Numerous other statutes in the Hammurabi Code pertained to beer. The code mandated that beer be exchanged for corn or barley of equal value. If the tavern keeper took money for beer, it had to be equal to the corn equivalent. The Hammurabi Code also had provisions in regard to beer purity. There are numerous references that the beer brewers in Babylonia were women. The Code of Hammurabi was just as tough on women as it was on men. Women tavern keepers were to be "thrown in the river" and presumably drowned if they short-changed their customers (Poelmans and Swinnen 2012; Horne et al. 1998; Preet 2005).

The Egyptians became familiar with beer through their trade with the Babylonians. Beer quickly not only became a staple in Egyptian society, it was firmly integrated into their religious lives. Egyptians held that Osiris, one of their most important gods, invented beer. Numerous tombs have been discovered in Egypt which contained beer recipes and beer-making ingredients. It was clear that the Egyptians had no plans to spend eternity in the afterlife without beer. Beer was so important to the Egyptians that they created a new hieroglyph for "brewer" (Samuel 1996; Standage 2005).

The process of brewing beer was well established by the time Egyptians were introduced to beer. The Egyptians began the process by making bread dough that was lightly baked and then crumbled into jars. Water was then added. This produced what today is known as wort. The Egyptians were the first civilization to add the additional step in the brewing process of boiling the wort. This additional process concentrated the sugars in the beer and presumably produced a stronger beer (Newkirk n.d.).

The Egyptians added numerous flavorings to their beer. They added dates to sweeten their beer. The Egyptians also sometimes added rue to add bitterness to their beer. Egyptians also flavored their beer with coriander, juniper, tarragon, anise and licorice root. Other more exotic flavorings included

balsam, hay, dandelion, mint, wormwood seeds, horehound juice, crab claws, and oyster shells. Olive oil, bog myrtle, cheese meadowsweet, mugwort, carrot also were used to flavor beer. Even hallucinogens such as hemp and poppy were added to beer (Newkirk n.d.; McGovern n.d.).

Beer represented something far more important to the Egyptians than simply something to quench the thirst. Beer was used to treat illness. One Egyptian text lists about 100 prescriptions that included the word "beer." When an Egyptian man offered a women a sip of his beer, they were considered married (Raley n.d.).

The Egyptians referred to their beer as "Hekt." It was exported to Rome, Palestine, even as far as India. As in many ancient civilizations, most brewers were women, although royal brewers were more likely to be men. Egyptian women produced many varieties of beer. These included white, black, brown and red beers. They also produced Nubian "boosa," from which the word "booze" originates. It is clear that beer was important in Egyptian culture, as forty percent of the grain production was dedicated to the production of beer. As in modern society, sometimes Egyptians drank too much. An inscription from an Egyptian tomb circa 2,800 B.C. stated, "His earthly abode (body) was taken and broken by beer" (Eames 1993).

Beer was important to all ranks of Egyptian society. Egyptian laborers received a beer ration of eight pints a day (Burch 2011). At the other end of the social spectrum, Pharaoh Rameses III held that beer was such a noble drink that he and his guests drank beer from golden cups (Poelmans and Swinnen 2012).

Geographic factors also determined that the Egyptians were a nation of beer drinkers. Herodotus noted that the Egyptians brewed "wine made of barley" because no vines grew in Egypt, even though it appears he did know grape vines grew on the Nile Delta. Herodotus concluded that the Egyptians were beer drinkers due to climatic factors (Nelson 2005).

While the region we know today as the Middle East was certainly a cultural hearth for beer, it was by no means the only one. Perhaps as early at 7,000 BCE the Chinese were brewing a beer known as "Kui" (Hartley 2012). In South America the Incas brewed "chica" from corn (Standage 2005). The Incas drank "chica" for ritual purposes. Traces of "chica" have been found at Machu Picchu. Thus, it seems apparent that the Incas certainly had developed a taste for fermented beverages. Beer became so central to their culture that being forced to drink water was seen as punishment (The Brussels Journal n.d.). Some speculate that beer may have first been brewed in the Amazon Basin as far back as 10,000 years ago (Eames 1993).

Returning to the Mediterranean region, it was the Egyptians who taught the Greeks to brew beer, which they called "zythos" (Nelson 2005). It appears that although the Greeks imported large quantities of Egyptian beer, they never trusted the beverage. Max Nelson notes in *The Barbarian's Beverage* that many Greeks, such as Aeschylus, considered beer to be an effeminate drink, and the Athenians were particularly fond of referring to beer as an effeminate drink. Nelson also notes that there is little evidence to support the oft cited quote of Aeschylus that beer was not even fit for pigs. The anti-beer views of the Greeks were so pervasive that Nelson devotes an entire chapter to "The Greek Prejudice Against Beer" and concludes the chapter by noting that the Greeks were the first cereal-growing people to reject beer. On the other hand, Sophocles considered beer to be healthy, as long as it was consumed in moderation, along with bread, meat, and vegetables (Poelmans and Swinnen 2012). While it is clear that the Greeks grew barley and had extensive trade in grain, they overwhelmingly chose to drink wine and not to convert their barley to beer (De Angelis 2002, 2006; Migeotte 2009). Despite their attitude toward beer, it was the Greeks who taught the Romans to brew beer. The origins of the word beer were somewhat muddled for the Romans. They referred to beer as "cerevisia," from Ceres, the goddess of agriculture, but it also appears that the word beer comes from the Latin verb "bibere" (to drink) (Nelson 2001, 2005).

It is clear that the Romans considered beer to be a drink fit only for barbarians. Tacitus wrote that the Teutons drank "a horrible brew fermented from barley or wheat, a brew which has only a very far removed similarity to wine." Beer was important to early Romans, but by the time of the Republic, Romans preferred wine over beer (Poelmans and Swinnen 2012). For the Romans, "wine was civilization." For the Romans, beer was something with which to soften ivory to make jewelry (The Brussels Journal n.d.). Though Romans preferred wine, they valued beer enough that they introduced it to other regions in Europe. During the war campaigns of 55 BCE, they introduced it to regions in Northern Europe. When Caesar crossed the Rubicon in 49 BCE, he toasted his officers with beer (Raley n.d.). It is clear that geography was a significant factor in determining where beer culture existed in the Roman Empire. Southern Europe remained a wine drinking region, while the northern regions of the empire, where barley grew well and grapes did not; beer was the preferred drink. One example would be in Britain where farmers produced malt and cereals for beer production (Whited et al. 2005).

Beer in Monasatic Europe

With the fall of Rome, the brewing of beer shifted to monasteries. St. Benedict established a monastery at Monte Cassino, Italy in 525 CE. St. Benedict stressed the need for self-sufficiency to his followers, including the brewing of beer. The monastic way of life quickly spread throughout Europe. By the Middle Ages there were over 400 monasteries brewing beer in Germany alone. Numerous saints are associated with beer brewing. Saint Columban, Saint Vedastes, Saint Sadalberga, Saint Guthlac were all associated with brewing (Nelson 2005). Numerous other saints are associated with beer brewing (Frank and Meltzer n.d.).

Beer brewing at monasteries quickly became a trade as the monks produced beer for themselves and for Christian pilgrims. Beer brewing became a very lucrative enterprise for the monasteries and helped finance their philanthropic efforts. Once again geography was a factor as monasteries established in southern Europe produced wine, while monasteries established in northern Europe brewed beer (Poelmans and Swinnen 2012).

What separated monks from the common brewer was their systematic approach to brewing beer. They recorded their recipes and strove to improve the quality of their beer. Monks selected the best ingredients, kept their equipment clean, and generally worked to brew a high quality product. In essence, monks adopted a scientific approach to brewing.

Charlemagne also played a major role in advancing the science of beer brewing. Charlemagne held the view that beer was an important part of life. Charlemagne is said to have personally trained his regime's brew masters. He retained a priest named Gall, later Saint Gall, to improve the brewing process. Gall introduced new ways to improve the mash, fermenting, and storing of beer (Poelmans and Swinnen 2012; Nelson 2005).

Catholic monasteries were not the only brewers of beer in Europe during the Middle Ages. In far northern Europe the Vikings were brewing a drink called "aul," which evolved into "ale" in English. Norse paradise, known as Valhalla, was described as a giant beer hall with 540 doors, where ale flowed freely from the udders of a mythical goat called Heidrun (Eames 1993; Preet 2005).

Beer was particularly popular in the Middle Ages because it was safer than water to drink. Luckily for all, the fermentation and brewing processes made beer far safer to drink than water (Poelmans and Swinnen 2012). It was Saint Arnold who warned, "Don't drink the water, drink beer (Frank and Meltzer n.d.)."

Around 800 CE brewers began to add hops to beer to add bitterness, flavor, and aroma to the beer. Prior to the addition of hops, beer was bittered with a mixture of spices and herbs known as gruit, old German for "wild herbs." The exact nature of the blend was a closely guarded secret by the Gruit Guilds (Poelmans and Swinnen 2012). The first reference to adding hops to beer is found in the statutes of Adalhard the Elder for the monastery of St. Peter and St. Stephen in Corbie, France, who in 822 CE mentioned the need to gather sufficient hops to make beer (Nelson 2005). Not only did hops bitter the beer, it also acted as a preservative (Martorana 2010; Shurkin 2012). The practice of adding hops to beer spread throughout continental Europe and reached Britain by the tenth century A.D. (Nelson 2005).

Taking note that beer brewing was very profitable, feudal lords in the twelfth Century began to take back the brewing rights they had previously granted the monasteries, so they themselves could control the brewing industry and the tax revenue that flowed from it. At the same time, many private families began brewing. The consequence of the rise in private brewing and government-owned breweries was that the monks, who had dominated beer brewing in Europe for centuries, were largely out of business (Poelmans and Swinnen 2012; Capano n.d.)

By the 1400s Bavarian brewers began to store their beer in caves in the Alps. They noticed that "lagering" gave their beer a crisp, clean taste. Centuries later brewers discovered what accounted for the taste difference was that ale was created with top fermenting yeast, but in the cold conditions in a cave in the Alps, yeast sunk to the bottom and created an entirely new bottom-fermented type of beer, which became known as "lager" (Poelmans and Swinnen 2012).

In the fifteenth Century the beer industry began to flourish in Bavaria. Breweries were established wherever the water was pure. The Isar River, which flowed through Munich, was perfect for brewing beer. By the end of the fifteenth century there were 38 breweries in Munich (Capano n.d.).

Over time the quality of beer in Germany declined. Brewers began to utilize lower quality ingredients. Feudal lords reacted to the decreasing quality of German beer with new laws. A 1447 ordinance in Munich mandated that brewers could only use barley, hops and water as ingredients in their beer. Duke George the Rich extended the 1447 ordinance to all of Barvaria. Finally, on April 23, 1516 Barvarian Duke Wilhelm IV issued the famous Reinheitsgebot or German Purity Law. The German Purity law restated the 1447 ordinance in that it decreed that barley, hops, and water were the only ingredients that could be used in the brewing of beer (Poelmans and Swinnen 2012). It's notable that yeast was not listed, as the role yeast plays in fermentation was yet to be discovered. It wasn't until the mid-nineteenth century that Louis Pasteur explained the importance of yeast in the fermentation process (Cutler 1996; Poelmans and Swinnen 2012).

Beer in Colonial America

When Columbus arrived in the New World he allegedly found the Native Americans brewing beer made from corn and black birch sap. There are numerous references to beer being brewed from corn at Sir Walter Raleigh's colony in Virginia in 1587. It appears that their beer lacked in quality as the colonists sent requests to England for better beer (Raley n.d.). The colonists were obviously concerned about their beer supply because in 1609 they placed advertisements in London seeking brewers for the Virginia colony (Hernandez n.d.). At Jamestown, the London Company sent trained brewers to provide beer for the colonists (Mittelman 2008).

Beer even played a role in determining the landing site of the Mayflower Pilgrims! When the Pilgrims landed at Plymouth, Massachusetts in 1620, it was because of beer, or rather, a shortage of it. The Pilgrims had planned to land at the Hudson River, New York, but due to fickle winds and poor navigation they landed at Cape Cod. With their beer supply running low, the

ship's crew forced the Pilgrims off instead at Plymouth with no beer so that the crew would have enough beer to make it back to England (Mittelman 2008). As one stated, "We could not now take time for further search or consideration, our victuals being much spent, especially our beere" (Cutler 1996). As the Europeans considered the water of the New World to be polluted, beer was an extremely important cargo on their ships as they traveled to North America (Poelmans and Swinnen 2012).

As in many previous eras, women brewed most of the beer in Colonial America (Mittelman 2008). A female beer brewer was known as an "alewife." Women brewed beer from corn, oats, wheat, honey, and molasses. Pumpkin beer was in abundance for the simple reason that pumpkins were readily available. Pumpkin beer was brewed throughout the eighteenth century until it declined in popularity in the nineteenth century (Eames 1993; Grimm 2011).

Beer certainly was a part of Colonial America culture. Before weddings, a nuptial beer was brewed. The proceeds from the sales of the beer went to the bride at her wedding. The phrase "bride-ale" is the origin of the word "bridal" (Eames 1993).

Even children drank beer in Colonial America. Children drank a watered-down version of beer known as small beer. Small beer was brewed from the spent grain used to make adult beer. Small beer had lower alcohol content than adult beer. Children were allowed to drink small beer because it was considered safer than water to drink. As in Europe, Colonial Americans knew beer was safer than water, but they did not yet understand that boiling the beer killed the bacteria in the water (Mittelman 2008). This connection between protection from water-borne illness and beer was made convincingly in John Snow's ground-breaking study of the London Cholera Epidemic of 1854. Snow found that brewery workers who were surrounded by a cholera outbreak did not become sickened because they were allowed to drink beer at work instead of drinking water from a local contaminated water well (Tufte 1997).

Geography clearly was a factor in the spatial diffusion of beer culture in Colonial America. Despite challenges from both apple cider and rum, beer remained a favorite beverage in the Northern colonies, particularly in barley and hops producing colonies such as New York and Pennsylvania. Both New York City and Philadelphia were major brewing centers. On the other hand, beer was never very popular in the Southern colonies as it tended to spoil in warm weather (Mittelman 2008).

Beer in Nineteenth Century America

Beer brewing in America was forever changed in the mid-nineteenth century with the arrival of waves of German immigrants. Between 1840 and 1860 more than 1,350,000 Germans came to the United States, primarily to the Midwest. The Germans brought a beer drinking culture with them. Soon the Germans were brewing the golden lagers and pilsners so relished by the throngs of German immigrants (Holland n.d.; Jackson 2006).

Milwaukee became a major beer brewing center in nineteenth century America. Milwaukee went as far as to claim the title of "beer capital of the world." Frederick Pabst and others brewed beer there. Pabst greatest contribution to the industry was in the area of bottled beer. By directly bottling beer, Pabst avoided a federal tax on kegged beer (Mittelman 2008).

St. Louis wasn't far behind Milwaukee when it came to the importance of beer to the city. Adam Lemp established what would become the Falstaff Brewing Company in St. Louis in 1840 to serve the large German immigrant population in that city. Later Eberhard Anheuser and Adolphus Busch arrived. Soon the brewers were united by marriage and established what would become a titan in the brewing industry (Holland n.d.).

Chicago also became a major beer brewing center. Germans poured into Chicago in the late-nineteenth century. By the early twentieth century more than 60 breweries existed in Chicago. Peter Hand was one of the most important brewers. His company produced Meister Brau from 1891 until 1978. Due to consolidation in the beer industry, many breweries in Chicago went out of business. Meister Brau was the last brewery in Chicago (Grimm 2012).

Prohibition and Mass Production

The beer industry suffered a devastating blow when Prohibition went into force in 1920. Brewers survived by brewing "near beer," which had an alcohol content of less than one-half of one percent. Other brewers produced malt syrup to stay in business. Still other breweries converted to production of soft drinks to keep their doors open. Interestingly, these experiences gave brewers experience in producing canned products. This paved the way for canned beer, which first appeared on the market in the 1930s. The dark period of beer history that was prohibition came to an end in 1933 when the 21st Amendment repealed prohibition (Poelmans and Swinnen 2012).

With the outbreak of World War II and women replacing men in the factories, brewers had to adjust their beer recipes. Women preferred a lighter beer than men. This worked out fine for the brewing industry as malted barley was in short supply. The beer industry added corn and rice to beer, making it lighter. When the war ended, the beer industry never went back to the old heavier-bodied beers (Poelmans and Swinnen 2012).

This was the beginning of a downhill slide in the quality of American beer that coincided with a wave of consolidation in the American beer industry. The top ten producers controlled 38% of beer sales in the United States in 1950. By 1980 the top ten producers controlled 93% of beer sales in the United

States. The mass produced beer of this era was a far cry from what beer had once been (Poelmans and Swinnen 2012).

Rise of Microbreweries

Beer lovers in the United States responded to this situation by resurrecting high quality beers in what were first known as microbreweries, which produced what are now known as "craft beers." The beginnings of this movement began in 1965 when Fritz Maytag, using a portion of his family's washing machine fortune, purchased the failing Anchor Brewing Company in San Francisco. Anchor Steam Beer is still produced today, and Maytag is seen as the spiritual father of the craft brewing industry. Steam beer traces its origins back to the 1840s gold rush in California where lager beer was produced without the benefit of refrigeration (Mittelman 2008).

The craft beer industry has grown steadily since the 1980s. One of the most successful craft brewers was Jim Koch, who established the Boston Beer Company, producer of Samuel Adams Boston Lager. By 1997 Boston Beer sales had reached 1,352,000 barrels annually. Other notable craft breweries included the Smuttynose Brewing Company, Sierra Nevada Brewery, and the Dogfish Head Craft Brewery. These and other craftbrewers produce a wide variety of beers, ranging from lagers to India Pale Ales (Mittelman 2008; St. Louis 2012). Currently there are more than 2,000 microbreweries in the United States (St. Louis 2012).

Conclusion

In conclusion, beer brewing has gone through a long evolution. Beer was first produced by accident when some wet grain was spontaneously fermented by wild yeast in the air. Beer culture developed in the Fertile Crescent region and then spread to Egypt and on to the Roman Empire and throughout Europe. Slowly and methodically brewers carefully learned their craft. Centuries of painstaking work by monks cloistered in monasteries produced better and better beer. Brewers discovered how to use hops to bitter and preserve their beer. Brewmeisters learned that beer stored in cold caves produced a different kind of beer that became known as lager. Beer culture spread to Colonial America and blossomed in U.S cities with large German populations during the Nineteenth Century. In the Twentieth Century beer survived prohibition and mass production. Finally, today we are in the midst of a beer renaissance with the rise of microbreweries and craft beer. The next time you have a cold, tasty beer, remember it all started by accident and that beer was the first step toward civilization.

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Mapping United States Breweries 1612 to 2011

4

Samuel A. Batzli

Abstract

The location of breweries in the United States is closely tied to historical themes. Economic expansion, war, immigration, temperance/prohibition, politics, religion, transportation, and economic depression all shaped the beer brewing landscape from colonial times to the present. This chapter draws upon a brewery database from the American Breweriana Association to geolocate breweries across the United States over time. I provide a time-series set of maps to illustrate the interplay and imprint of the aforementioned themes. Comprehensive time-series maps of this nature have rarely, if ever, been assembled. By compiling maps in this way it is possible to observe geographic patterns and explore historical connections and spatial relationships from regional and national perspectives. In some cases, we find what we expect from known historical events; but we also find inconsistencies, distinctive patterns not accounted for in the history literature. In this way we may come to understand better the regional patterns we see today. Brewery locations today are not only a legacy of the past but also a reflection of contemporary society and culture.

Introduction

About 20 years ago I encountered a remarkable book, "*One Hundred Years of Brewing*." Published in 1903, this richly illustrated 718-page history of the brewing industry up to the beginning of the twentieth-century gives special attention to the people and businesses that shaped the development of brewing in United States. In tracing their stories, the volume hints at a sub-text of geographic patterns and expansion, yet it contains no maps. In 2012 I became aware of a nearly comprehensive database of historical and contemporary breweries of the United States. The American Breweriana Association (ABA) maintains and continually updates an historical database built upon the information contained in "American Breweries II" (Van Wieren 1995), a detailed listing organized by city and state, of every brewery known to have existed in the United States and its years of operation. In addition to "American Breweries II," the ABA database incorporates information from historical publications, local and regional histories, trade journals, contemporary newspapers, and of course, *One Hundred Years of Brewing*. It represents the labor of many dedicated hobbyists and historians and is arguably the most comprehensive database of its kind in existence. This chapter presents a set of maps of the historical locations of breweries of the United States that I derived from the ABA database.

These maps provide us with glimpses of the brewing landscape and its transformation. Distinctive patterns emerge and change over time providing us with opportunities to consider and assess the historical and geographic influences and consequences of brewery locations. The brewing landscape has always been and continues to be dynamic. Today, in the second decade of the twenty-first century, we find that the United States is experiencing a boom in the number of new breweries. According to the ABA database, the net number of operating breweries grew from 85 to 2,010 between 1981 and 2011. An overwhelming majority of these have been brew pubs and microbreweries. There are as many breweries in the United States today as there were at the pre-prohibition

S. A. Batzli (✉)
Space Science & Engineering Center,
University of Wisconsin-Madison,
1225 W Dayton Sreet, Madison, WI 53706, USA
e-mail: sabatzli@wisc.edu

M. Patterson, N. Hoalst-Pullen (eds.), *The Geography of Beer*, DOI 10.1007/978-94-007-7787-3_4,
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peak of the 1870s. And while the patterns of location are somewhat different between the pre-prohibition and the map of today, it appears that today, as in the 1870s, people are again drinking beer where it is made.

Mapping Methods

The ABA database is the result of countless hours of many individuals dedicated to documenting the history of the American brewing industry. The foundation for the database is the publication "American Breweries II" that consists of detailed listings, by state and city, of every brewery known to have existed in the United States from colonial times up through 1995 when the book was released. American Breweries II contains over 18,000 listings. Subsequent research and updates to the database have brought the current database records to over 23,500.

In August of 2012 I worked with the ABA and acquired a simple dump of their database as a comma separated value text file. It contained 23,521 records with brewery id numbers associated with the American Breweries II numbering system, city, state, year of opening, and year of closing.

My goal became to map breweries by city over time. For national scale mapping, the database contained all the basic information I needed. However, I quickly discovered that there were multiple records for most of the breweries in the database. Each time a brewery changed ownership or name, a new record appeared in the database. This is a valuable feature of the database for understanding the transformation of the industry at a local scale. But for my purposes, such detail posed a challenge. I wanted each point on my time-series maps to refer to a particular location of brewing activity, regardless of ownership and name changes. I discovered that the 23,521 records in the database actually corresponded to 12,459 actual brewing locations or physical breweries over time, and I needed a way to consolidate the records without losing the integrity of the data. Because of the size and complexity of the data I decided to build a spatial database to pursue my analysis and mapping goals.

Data Preparation

I built a spatial database with two basic tables: breweries and cities. I loaded the ABA data into the "breweries" table and spatial data for city and town locations from NationalAtlas.gov into the "cities" table. I used city name field in each table to join them for mapping. But before I could join the tables, I needed to consolidate the ABA records so that each record represented a single brewery and its dates of operation. Fortunately, the field "abii" in the ABA data corresponds to the "American Breweries II" alphanumeric reference system. In this system, within each state, each brewery gets a unique identification number to which is appended a letter of the alphabet if it changed ownership, changed name, or ceased operation only to start up again at a later date. For example, a record might look like this:

MD	73a	John Mueller (394 Pennsylvania Ave & Pitcher St)	1869–1880
	73b	Mrs. John Mueller (Catherine)	1880–1884
	73c	(Catherine) Mueller & (Robert) Handloeser	1884–1890
	73d	Western Maryland Brewery, Robert Handloeser	1890–1897

MD	77f	George Brehm & Son	1911–1920
	77g	Brehm Beverage Co.	1920–1923
	77h	Baltimore Brewing Co., Inc.	1927–1931
	77i	Baltimore Brewing Co., Inc.	1933–1935

These four records needed to be combined into a single record. Another example contained a disruption of activity.

Because of my interest in mapping breweries in operation over time, I wanted to preserve gaps of production. This partial example of item 77 needed to be consolidated into three records because the brewery closed twice during prohibition (with only 77f and 77g being combined). Of the 23,509 records in the database, I found 6,550 had single-part records and 16,959 consisted of multi-part records. I devised a programmatic way to combine records while preserving location and date information.

Geocoding

In order to map the locations of breweries, I acquired the best publically available geographic information for cities, towns, and other populated places that I could find. I downloaded an ESRI shapefile (a set of map-able spatial tables) called "Cities and Towns" (from NationalAtlas.gov). I used ArcGIS to simplify the data table and calculate the latitudes and longitudes for all the records in the file. Then I uploaded the file into the spatial database.

Realizing many of the brewery locations in the database reference historical towns, some of which experienced name changes, disappeared, or became ghost towns, I ran an exclusion query to see which brewery records did not match known city locations.

The initial of the exclusion query result produced approximately 3,000 records (about 25 % of the 12,459 total). This prompted me to examine the "cities" field of the brewery table for anomalies. I found several issues. In some cases, city names included special characters, such as asterisks, parentheses, and apostrophes while their counterparts in the name field of the "cities" table did not. The anomalies caused errors of omission when I joined the tables. I also found that abbreviations for common words such as Mount

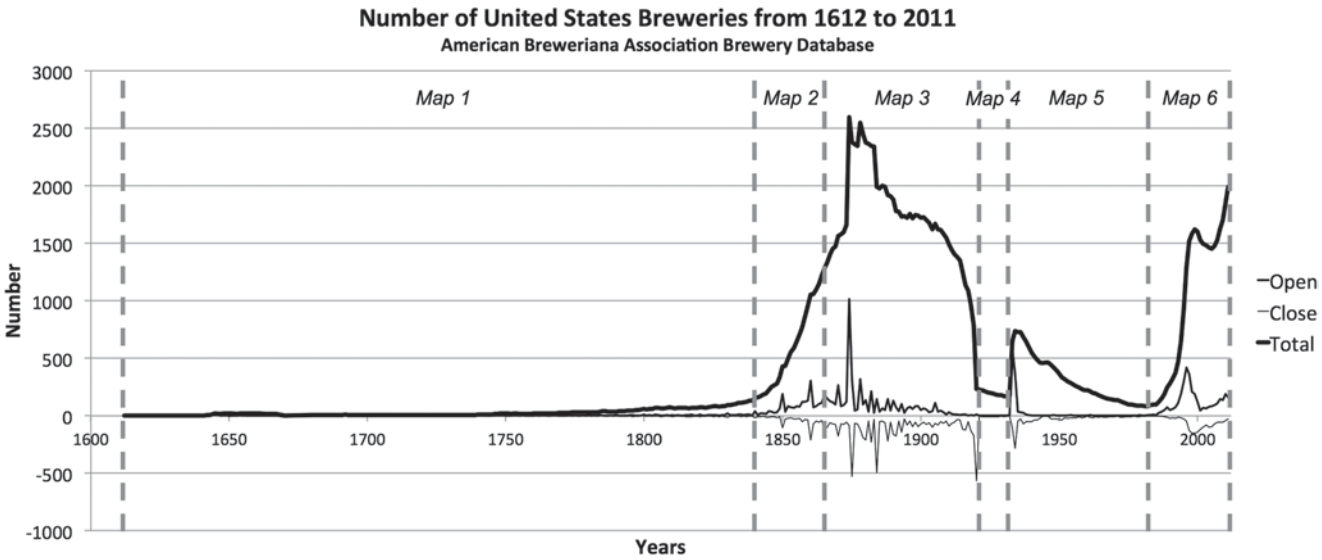

Fig. 4.1 This graph depicts a running count of the number of breweries that functioned during a given year according to the ABA database. The *blue line* represents the number of breweries that opened during a given year. The *red line* is the number that closed during that year. The *purple line* is the difference between openings and closing and serves as a running total. *Vertical dashed lines* represent the break points I chose that correspond to the mapping time periods

(Mt.) and Saint (St.) caused errors of omission, as did extra spaces between words and trailing spaces in the values of the "city" field of the breweries table. To correct this I manually eliminated extra spaces between words and used a query to trim the trailing spaces.

After modifying entries in the breweries table accordingly the number of mismatched records shrank to 731 unique city name mismatches. With mismatches still running over 10 %, I decided to find additional locational information using online geocoding services and a US Geological Service historical place names database. Ultimately, I successfully mapped 96.2 % of the total breweries from the ABA database.

The Maps

Commercial brewing in the United States dates from 1612 to the present. I chose to divide this timespan into six periods based on historical trends and database characteristics. Significant historical events or trends in brewing history provide the basic outline, but these trends are not always appropriate for mapping. To further refine the time periods for mapping, I focused on trends in the database. I generated a timeline and a graph from the full ABA database (Fig. 4.1), compared it to historical trends described in the literature, and looked for "natural breaks" or groupings in the data. I sorted the data by year and compared the numbers of brewery openings and closings, looking for maximums and minimums within and between established historical trends. The numbers of openings and closings mostly correspond well to historical events, with some minor shifts. For example, even though prohibition came into effect in 1920, the map of breweries reflects the change in 1921 since many breweries continued operations until early in 1920. In some cases I combined time periods when the geography did not significantly change, despite major historical events. For example, the end of the nineteenth century and beginning of the twentieth century included post-Civil War reconstruction policies, economic panics, and fluctuations in the numbers of breweries, but test maps showed that the locations of breweries within the larger time period did not change significantly. I made choices and compromises in lumping and splitting the brewery statistics in an effort to emphasize general geographic patterns

Map 1	1612–1840	This time period covers the beginnings of commercial brewing up to the introduction of lager yeast in the United States
Map 2	1841–1865	Starting with the introduction of lager beer, this time period includes a period of immigration, the California gold rush and concludes with the end of the end of the Civil War
Map 3	1866–1920	The peak of brewing characterizes this time period. Industrialization, continued immigration, post-Civil War reconstruction, World War I, and the opening of the West led to the peak years of the industry but also significant decline
Map 4	1921–1932	This time period covers the core years of prohibition
Map 5	1933–1985	This period of brewing revival and industry consolidation ends just before microbreweries began to take hold
Map 6	1986–2011	The time period marks a renaissance in United States brewing. New brewpubs and microbreweries have pushed the number of breweries to their highest levels since the 1870s

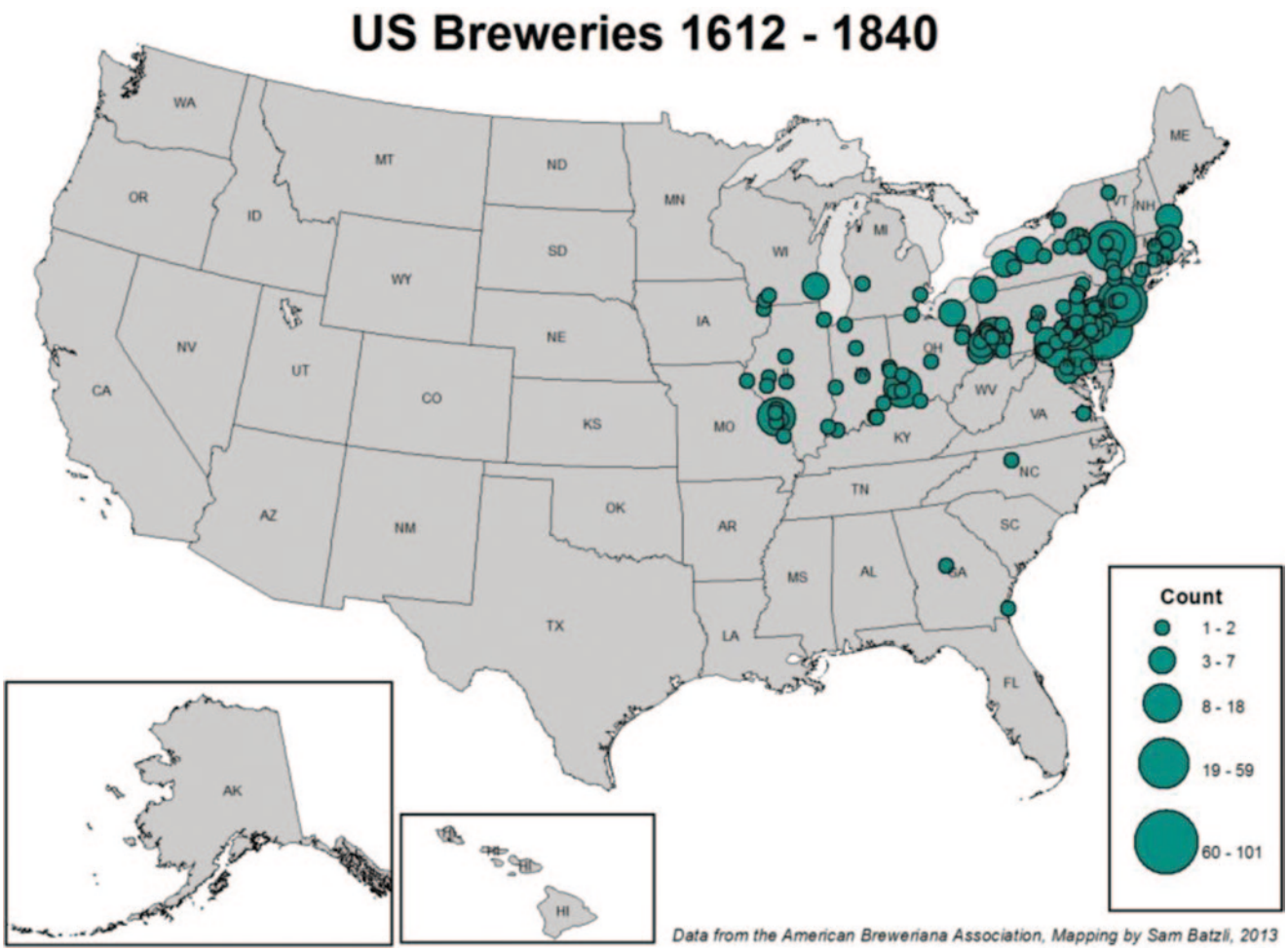

Fig. 4.2 Breweries active between 1612 and 1840. Data from the American Breweriana Association

without losing sight of the historical trends that drove them. I identified the following six time periods for mapping:

Map 1: 1612-1840

The story of brewing in Colonial America and the early years of the United States is one of taverns and local distribution. Historians identify the initial brewery as a 1612 Dutch establishment in what today is Lower Manhattan (Smith 1998; Yenne 2003). From this time until 1840 beer continued to be a localized beverage with 132 towns and cities accounting for 494 breweries active at some point during those 229 years.

In general, brewing followed the spreading population of the Colonies and young country but with a distinctly northern bias. The cities of the northeast represented the largest concentration of breweries and taverns with strong representation in the cities of Pennsylvania and New York. Table 4.1 shows the top ten cities by number of breweries, taverns, road houses, and inns that brewed beer commercially.

Table 4.1 From 1612 through 1840, 132 different cities supported 494 breweries. This is a list of the top ten cities by number of breweries from the ABA Database

Rank	City	Number of breweries 1612–1840
1	Philadelphia, PA	101
2	New York, NY	59
3	Albany, NY	36
4	Baltimore, MD	18
5	Pittsburg, PA	17
6	St. Louis, MO	13
7	Cincinnati, OH	13
8	Lancaster, PA	13
9	Brooklyn, NY	10
10	Troy, NY	7

During this time period, practical experience and popular consensus placed beer as a safer, healthier beverage to drinking water (Smith 1998). Given that the process of brewing involves boiling the water and grain mash prior to fermentation, eliminating the possibility of contaminated drinking water, these health claims make sense to us now.

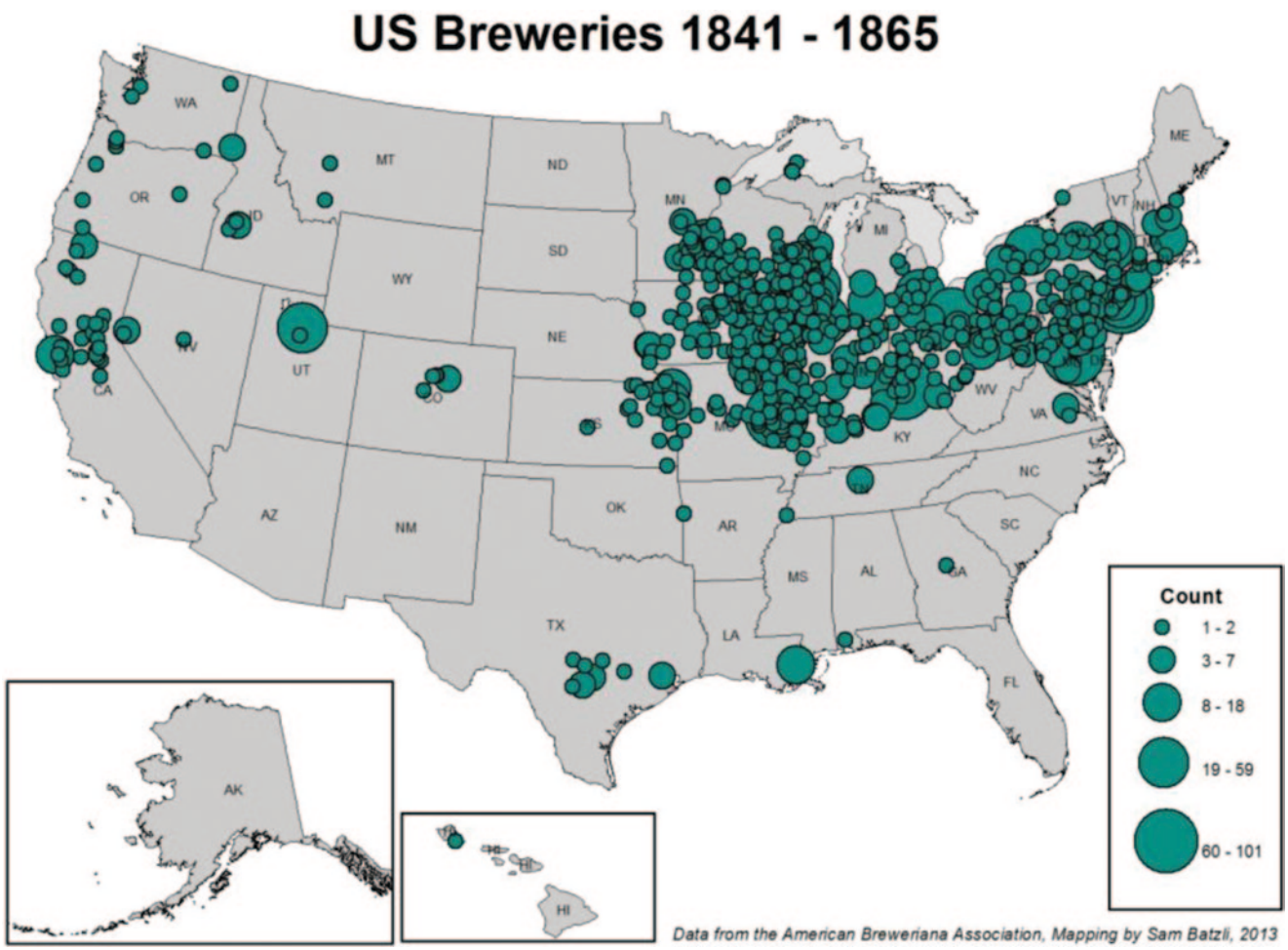

Fig. 4.3 Breweries active between 1841 and 1865. Data from the American Breweriana Association

The lack of breweries in the south stands in stark contrast to more northern regions (Fig. 4.2). There are several contributing factors to this pattern. Most of the early brewing followed English and Dutch traditions established in the northern colonies (Meinig 1986). During this time period, the large African American portion of the population of the south was enslaved and not at liberty to purchase beer. For those who were in a position to purchase beer, many avoided alcohol for religious reasons. Unlike the Italian-, Irish-, and German-Catholic immigrant populations of the north, southern states tended towards forms of the Baptist faith that discourages alcohol consumption (Meinig 1998, 2004). Even so, among those who did drink, alternative alcoholic beverages were more popular in the south. These included hard cider from apples, distilled spirits (such as bourbon and whiskey) from corn mash, wine imported from Europe, and rum from sugar cane via Caribbean influences. It is not too surprising that Florida is devoid of breweries. Florida remained under the control of Spain until 1822 and did not achieve statehood until 1845 (Meinig 1993).

The number of breweries did not grow significantly during this period. This is partly due to limitations on available ingredients. The primary ingredient for brewing was either wheat or barley. During Colonial times, cultivation of these crops was limited. It was not until 1850 that the United States produced significant quantities of domestically cultivated barley (The Western Brewer 1903), and early brewers relied on imported ingredients.

Clearly visible in the map are the breweries that sprung-up along the Erie Canal. Opening in 1825, the canal connected the Atlantic Ocean via the Hudson River and Albany to Buffalo and the Great Lakes. It served as a major transportation route for both people and commerce through the remainder of this time period and beyond.

The beginning of German immigration of the 1820s and 1830s is visible through the breweries established in Pittsburg, Milwaukee, Cincinnati, and Saint Louis. The number of German immigrants jumped from 6,761 in the 1820s to 152,454 in the 1830s (Dinnerstein and Reimers 1988). They brought not only a beer-drinking tradition but brewing expertise. This set the stage for the first major upswing in the number of breweries.

Map 2: 1841–1865

The next phase of brewing history started with the introduction of lager beer, included the California gold rush, additional European immigration, and concluded with the end of the Civil War. Beer had become a beverage associated with the working class. During this time the number of cities and towns with breweries increased to 649. These cities and towns often hosted more than one brewery, and we find a total of 2,189 breweries operating within these cities and towns at any given time during the time period.

The popularity of beer grew markedly after the introduction of lager beer. The increase in popularity resulted in an increase in the number of breweries. Two basic categories of brewing yeast define the foundation of all common beer styles: top-fermenting ale yeasts and bottom-fermenting lager yeasts. In 1840, the Spaten Brewery in Munich, Germany and the Schwechat brewery in Vienna, Austria were the first to brew lager beer commercially. That same year, lager yeast arrived in the United States with German immigrants. The lighter flavor, higher level of carbonation, and golden appearance gained favor immediately over the heavier, warmer, darker English ales. New breweries offered lagers, and old breweries began to offer lagers or even switched over from ales to lagers entirely. As an indication of their growing popularity, by 1865 lagers had largely replaced ales in terms of availability and production (Yenne 2003).

The introduction of lager expanded the market for beer, and its per capita consumption increased. It also created a need for ice or refrigeration since lager beers are typically fermented at temperatures between 35 and 40 °F for several weeks. The availability of ice, harvested from lakes in the winter and stored in ice houses throughout the summer, shaped the brewing landscape. Brewing remained largely a northern industry (Fig. 4.3). Lager beer became associated with German brewers and moved across the country with them, shaping the brewing landscape further. Chain migrations of Germans to Colorado, New Orleans, and several cities of Texas are clearly visible in the map. For example, the Texas cities of New Braunfels, Houston, San Antonio, Austin, Fredericksburg, and others supported a total of 18 breweries during the time period. By the end of the 1850s more than 20,000 German-born Americans resided in what is referred to as the "German Belt in Texas" (Jordan 2013).

Breweries appear to have followed the mining industry as well. Mine towns or suppliers in Utah, California, and other Western states can be identified in the map by the breweries they supported. For example, Salt Lake City saw 20 breweries operate at one time or another during the years form 1841–1865. California supported 49 breweries throughout the gold rush of the late 1840s, many in mining towns or the towns that supplied miners.

Table 4.2 From 1841 through 1865, 649 different cities supported 2,189 breweries. This is a list of the top ten cities by number of breweries from the ABA Database

Rank	City	Number of breweries 1841–1865
1	Philadelphia, PA	190
2	New York, NY	95
3	St. Louis, MO	84
4	Cincinnati, OH	69
5	Baltimore, MD	62
6	Chicago, IL	57
7	Detroit, MI	50
8	Milwaukee, WI	48
9	Albany, NY	37
10	Rochester, NY	37

What this map shows us is that from 1841 to 1865, despite the increase in production and consumption, brewing remained a local affair with limited regional distribution. People drank beer near to where it was made (Table 4.2).

Map 3: 1866–1920

The time period from the end of the Civil War to the eve of prohibition captures the high point of brewing in the United States in terms of numbers of breweries and geographic extent. Industrialization of the brewing process and the rise of large-scale regional brands began during this period and account for much of the growth. But subsequent social and cultural influences in the form of temperance and anti-German sentiment counteracted this growth by the end of the period.

The map (Fig. 4.4) shows a heavy density of brewing activity in the Upper Midwest and Northeast with increased activity in the West. Alaskan and Arizonian breweries in mining towns make their first appearance, and even the South begins to show breweries in the urban areas in the decades following the Civil War. During this time the number of cities and towns with breweries increased to 1,893 with 6,002 breweries cumulatively in operation at one time or another during these 55 years (Table 4.3). The number of active breweries peaked in 1874 with 2,597 breweries simultaneously in operation. But like the economy, the business was volatile: 526 breweries closed in 1875 alone. Industrialization of the brewing process and the rise of large-scale regional brands began during this period.

While the map indicates that brewers established new businesses where brewing was already happening, breweries also sprung-up in many new parts of the country. In the West, resource extraction in the form of mining and logging seems to have driven brewery locations as brewers established breweries in towns with names like Placerville, Goldfield, and Eureka. Virginia City, Nevada, a famous mining town, supported 11 different breweries during this time period.

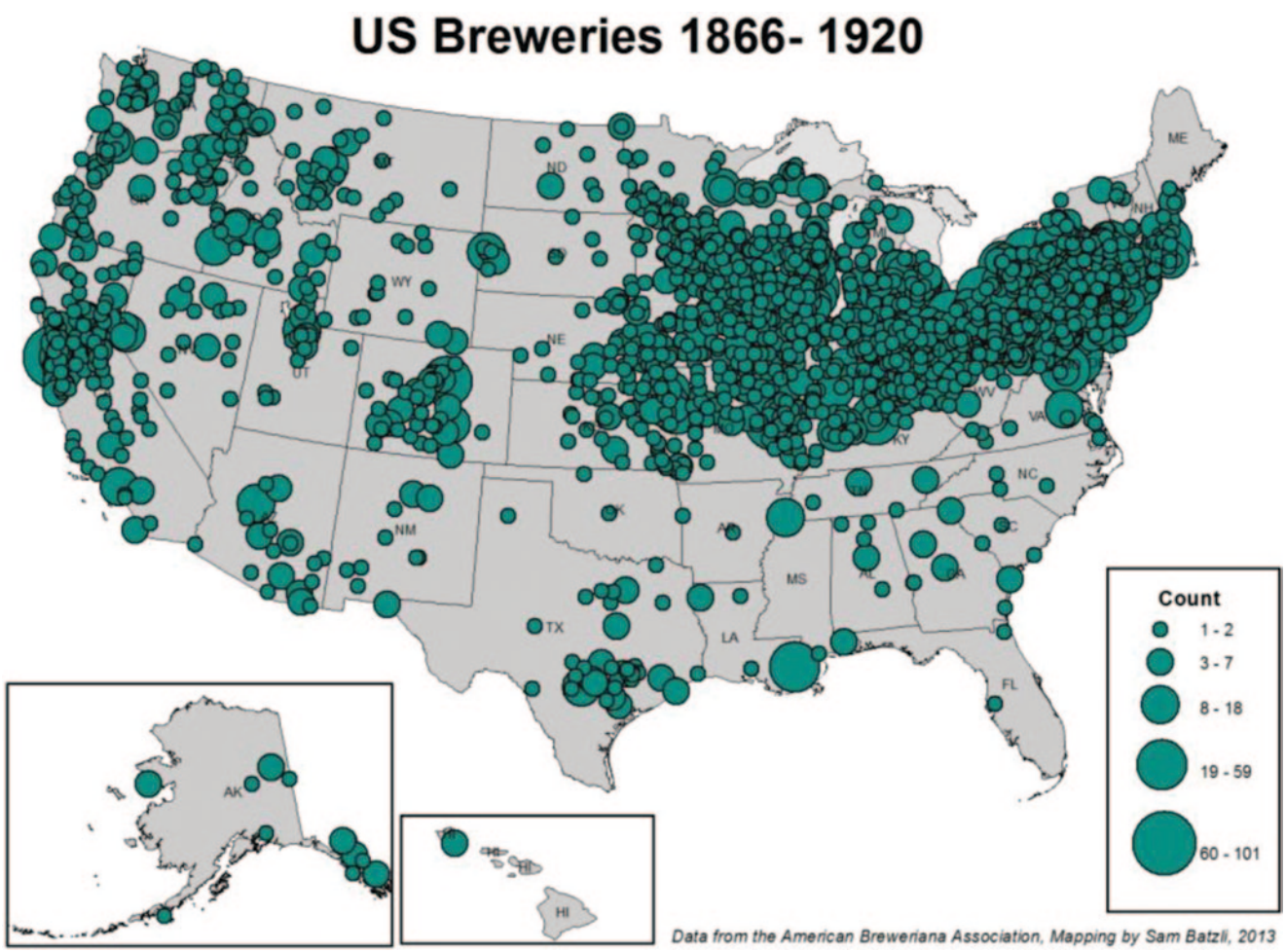

Fig. 4.4 Breweries active between 1866 and 1920. Data from the American Breweriana Association

Additionally, development of rail transportation facilitated access to ingredients and distribution of beer and fostered the beginnings of regional markets. With the opening of the West and statehood for several former territories, places that had little or no brewing activity up through the Civil War established breweries during this period.

This time period saw the rise of family brewing dynasties and large-scale regional operations. The business practices of George Ehret in New York City, Adolphus Busch of St. Louis, the Best brothers, Frederick Miller, Frederick Pabst, Valentine Blatz, Joseph Schlitz, all of Milwaukee, led to the establishment of large, successful brewing operations with names familiar today. And there were more. Wisconsinites Gottlieb Heileman and Jacob Leinenkugel, Bernard Stroh of Detroit, Jacob Schmidt and Theodore Hamm of Minnesota, Portland's Henry Weinhard, and Colorado's Adolph Coors all grew their businesses by implemented technologies such as mechanical refrigeration and process mechanization. As their names indicate, most of these families shared German heritage. Brands such as Dixie and Jax established footholds in New Orleans. Lone Star and Shiner emerged in Texas. Olympia in Washington, Grain Belt in Minnesota, and Ballantine and Schaefer in New York all can trace their roots to this time period. Ultimately, by the turn-of-the-century, these emerging regional brands began to eclipse many of the small-scale breweries and taverns that had flourished in the 1870s (Yenne 2003).

Industrialization during this time period involved all aspects of brewing. Innovations included brewery architecture for more efficient movement of ingredients and products; mechanization for cleaning and pasteurizing kegs and bottles; refrigeration for the cold fermentation required by the lager style of beer; and forced carbonation for beer "on tap." The volume of beer produced by the end of the period reflected these innovations. In 1840 the United States ranked a distant sixth in production of beer when compared to the United Kingdom and other European countries. By 1880, all six leading countries had increased output, but the United States had risen to third, trailing only the United Kingdom and Germany (The Western Brewer 1903).

The story of brewing during this time period is also about decline. Even as western expansion rode a wave of economic

Table 4.3 From 1866 through 1920, 1,893 different cities supported 6,002 breweries at one time or another during this time period. This is a list of the top ten cities by number of breweries from the ABA Database

Rank	City	Number of breweries 1866–1920
1	Philadelphia, PA	299
2	New York, NY	145
3	Chicago, IL	140
4	Brooklyn, NY	94
5	Baltimore, MD	89
6	St. Louis, MO	85
7	San Francisco, CA	79
8	Detroit, MI	78
9	Pittsburg, PA	60
10	Cleveland, OH	54

prosperity, disruptions such as the recession of 1873 forced many breweries to close. Social and cultural influences exerted pressures as well. World War I brought with it a wave of strong anti-German sentiment that some credit for the nearly 50% decline in production from 4.2 million barrels in 1912 to 2.2 million barrels in 1918 (Yenne 2003). Temperance began its slow evolution from a movement of moderation to one of abstinence and ultimately to prohibition. Initially, and even today, prohibition was a matter of local and county governments to determine. Local governments established dry towns and counties. As the prohibitionist "drys" gained political power, more and more communities opted-out of alcohol sales, setting the stage for national prohibition (Barron 1962).

Map 4: 1921–1932

In January of 1920, the United States put into effect the Eighteenth Amendment to the U.S. Constitution. The national prohibition of the production, sale, transportation, import, or export of alcoholic beverages began its 13-year hold on the country. The brewing industry was decimated. With commercial brewing deemed illegal, the number of breweries dropped dramatically. The ABA database shows that by 1921 only 144 cities accounted for 255 breweries. The map in Fig. 4.5 reflects this change. The breweries that survived did so for a variety of reasons, and their locations are significant in a number of ways.

The larger breweries that were able to stay open during prohibition generally did so by producing alternative products such as near-beer, soft drinks, and malt syrup (Feldman 1927). The general pattern of the map for this time period resembles the map from the 1612–1840 time period, and in one sense the location of surviving breweries contracted to many of their original strongholds. However, another pattern is present in the map.

Certain cities became notorious for bootlegging, smuggling, and/or illegal alcohol production. Chicago, New York, Brooklyn, Detroit, Baltimore, San Francisco, and New Orleans are noted by Okrent (2010) as being among the "wettest" cities during prohibition. This resulted largely from a mixture of organized crime, political corruption, and lax enforcement. These cities are notable on the map as having surviving breweries. In the list of cities with the most breweries (Table 4.4), six of these seven cities are listed.

Prohibition had a number of secondary effects on beer brewing. The "fruit juice" clause of the Volstead Act gave wine and cider a certain level of legitimacy that was not shared by beer. "Medicinal" use of distilled spirits available through doctor's prescriptions also elevated the market share of hard liqueur relative to beer (Okrent 2010). This combined with the dramatic decline of breweries limited the availability and popularity of beer relative to competing beverages.

The geography of breweries during prohibition reflects a combination of large brewing companies (such as Anheuser-Busch) that held enough capital and auxiliary capabilities to weather the storm (Feldman 1927) and breweries in cities that remained "wet" (Okrent 2010). Breweries that did survive were well positioned for success following prohibition. Economies of scale set the stage for the industry consolidations that followed in the years after prohibition.

Map 5: 1933–1985

Following prohibition, the United States experienced an immediate increase in new breweries followed by a long, steady decline in numbers. Figure 4.1 shows this trend. While the consumption of beer increased, the number of breweries producing beer decreased. More to the point, the number of companies operating these breweries and producing beer decreased. The map in Fig. 4.6 captures the locations of these post-prohibition breweries as the decline set-in. In 1947 there were 421 independent beer companies; by 1985 there were approximately 40 (Tremblay and Tremblay 2005). Historically we know that this time period resulted in the massive consolidation of the industry and the emergence of national brands. The related mass marketing and national distribution networks resulted in a loss of beer diversity. By 1985 the beer market was dominated by a handful of companies and even fewer styles of beer. The map of breweries from 1933–1985, like the other maps, represents all breweries active during that time period, regardless of their output volume. While it does not depict the consolidation or decline in numbers we can see subtle patterns in the brewery geography that relate to historical trends.

There were several historical circumstances and drivers that contributed to consolidation. First prohibition removed small brewing companies that did not have the capital to adapt to different products or ride-out the storm. Second, the emergence of a robust national transportation infrastructure in the

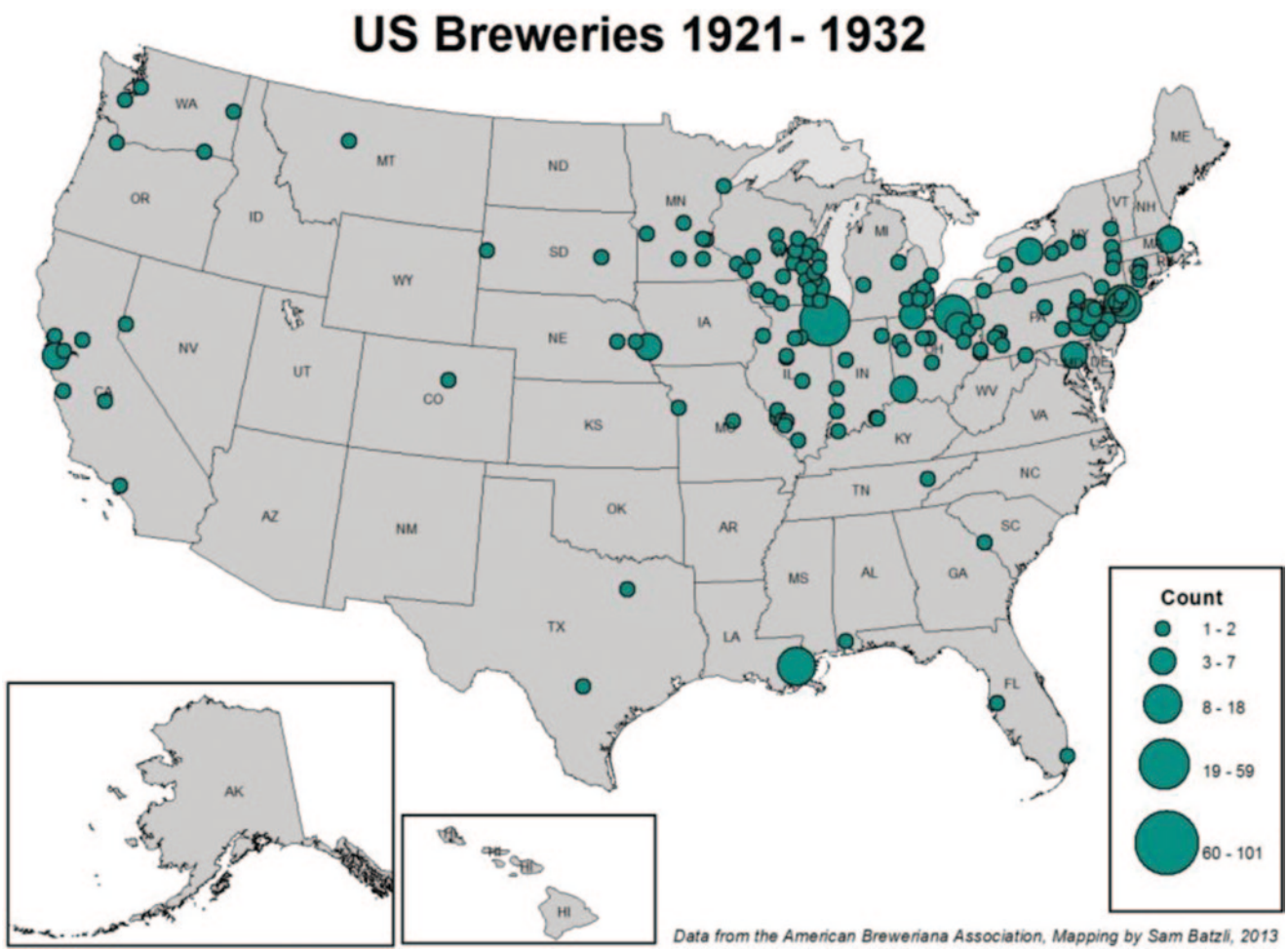

Fig. 4.5 Breweries active between 1921 and 1932. Data from the American Breweriana Association

Table 4.4 From 1921 through 1932, 144 different cities supported 255 breweries at one time or another during this time period. This is a list of the top ten cities by number of breweries from the ABA Database

Rank	City	Number of breweries 1921–1932
1	Chicago, IL	31
2	Brooklyn, NY	12
3	New Orleans, LA	9
4	Cleveland, OH	8
5	Detroit, MI	7
6	New York, NY	7
7	Baltimore, MD	5
8	Cincinnati, OH	4
9	Reading, PA	4
10	Milwaukee, WI	4

form of the interstate and federal highway system facilitated product distribution. Third, advertising played a key role in establishing national brands and promoting consolidation. Finally, as companies grew, scales of economy and aggressive pricing favored those larger companies (Tremblay and Tremblay 2005). These factors shaped the geography.

With the possible exception of Wisconsin and its Germanic heritage, the location of breweries became less about tradition and the cultural origin of the brewers and became more about macroeconomics. Figure 4.6 reflects this, and for the first time the distribution of breweries in the South and Great Plains is fairly uniform. Los Angles, Seattle, and Portland standout as brewery location more closely mirrors population than in previous eras with Los Angles entering the top-ten list (Table 4.5).

The change in market share for the leading brewing companies is striking during this period and had a direct effect on the location of brewing today. As companies consolidated, regional brands emerged and further consolidated as national brands. In 1950 the top five American brewing companies held 24% of the market. In 1960, market share rose to 32%. By 1970 it had reached 49%, and by 1980 it stood at 75% (Yenne 2003; Shih and Ying Shih 1958). By 1985 three companies dominated the market: Anheuser-Busch, Miller, Schlitz-Stroh. Four other companies, considered "second-tier" at that time but contenders for market share through mergers, were Pabst, Coors, Genesee, and Heileman (Tremblay and Tremblay 2005).

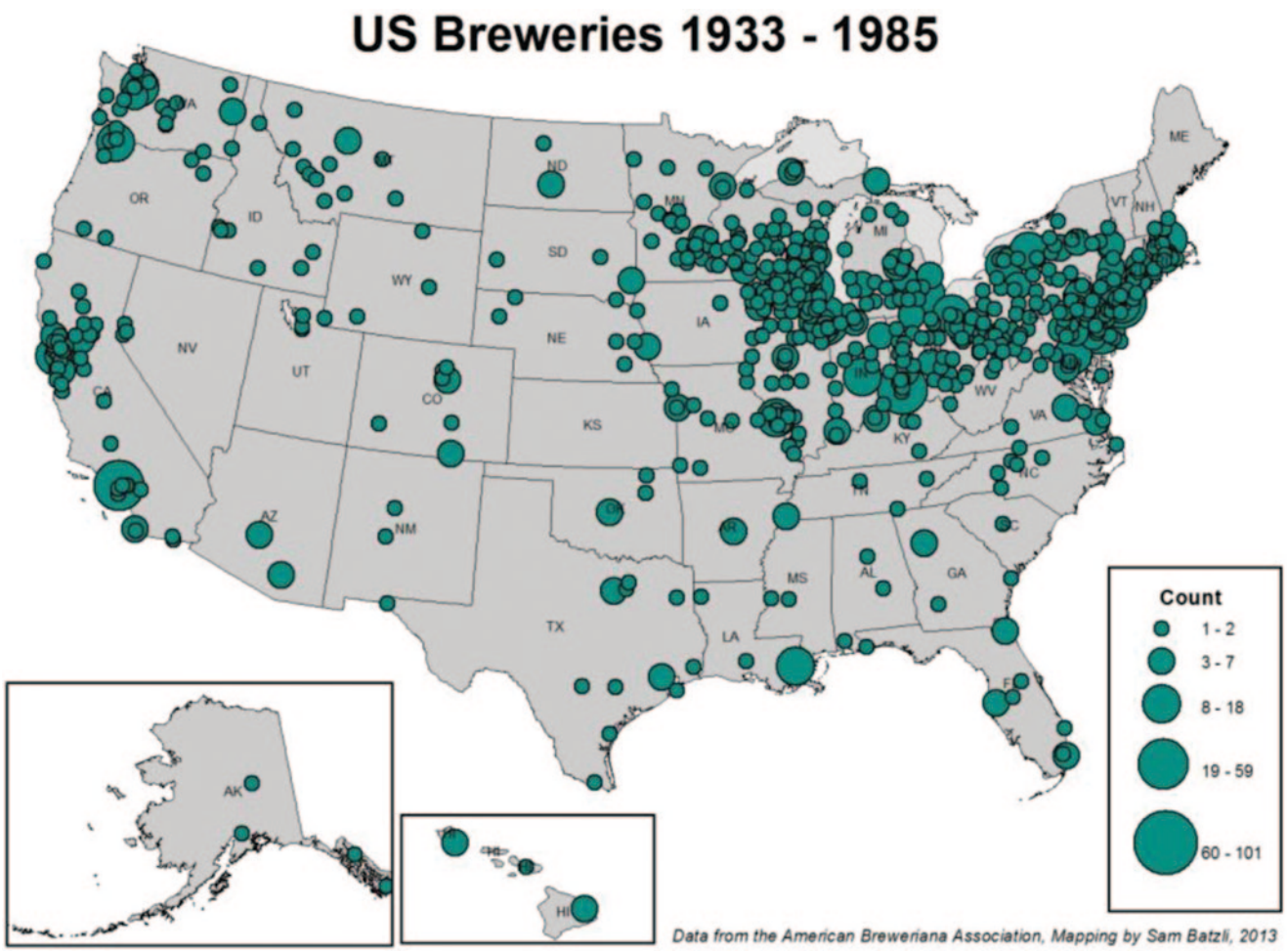

Fig. 4.6 Breweries active between 1933 and 1985. Data from the American Breweriana Association

Table 4.5 From 1933 through 1985, 649 different cities supported 1,337 breweries at one time or another during this time period. This is a list of the top ten cities by number of breweries from the ABA Database

Rank	City	Number of breweries 1933–1985
1	Chicago, IL	43
2	Detroit, MI	27
3	Philadelphia, PA	24
4	Los Angeles, CA	22
5	Cincinnati, OH	21
6	New York, NY	19
7	San Francisco, CA	16
8	Saint Louis, MO	16
9	Cleveland, OH	15
10	Newark NJ	14

Initially brands were associated with regions, but by the 1970s, it no longer mattered where the beer was actually brewed.

Consolidation had an effect on beer variety and quality. Prior to prohibition, ales and lagers were made almost exclusively with malted barley or wheat and many styles persisted. As early as the 1880s brewers added rice or corn to give lagers a lighter character (Barron 1962), but this trend was taken to an extreme during the period of consolidation (Yenne 2003). In an effort to cut costs and expand the market, the large breweries began more aggressive use of rice and corn. This also allowed brewers to, reduce calories, lighten the beer's appearance, and generate a uniform set of national products. By the 1980s, light "flavor-neutral" pilsner-style lagers dominated the market and became virtually indistinguishable from one another (Tremblay and Tremblay 2005). This set the stage for the current renaissance in American beer brewing and major changes in its geography.

Map 6: 1986–2011

After 35 consecutive years of declining numbers of breweries, the ABA database shows that 1982 marked the first year in which the number of new breweries out-numbered the number that closed. By 1986 these new breweries began to take hold in the form of microbreweries, brewpubs, and

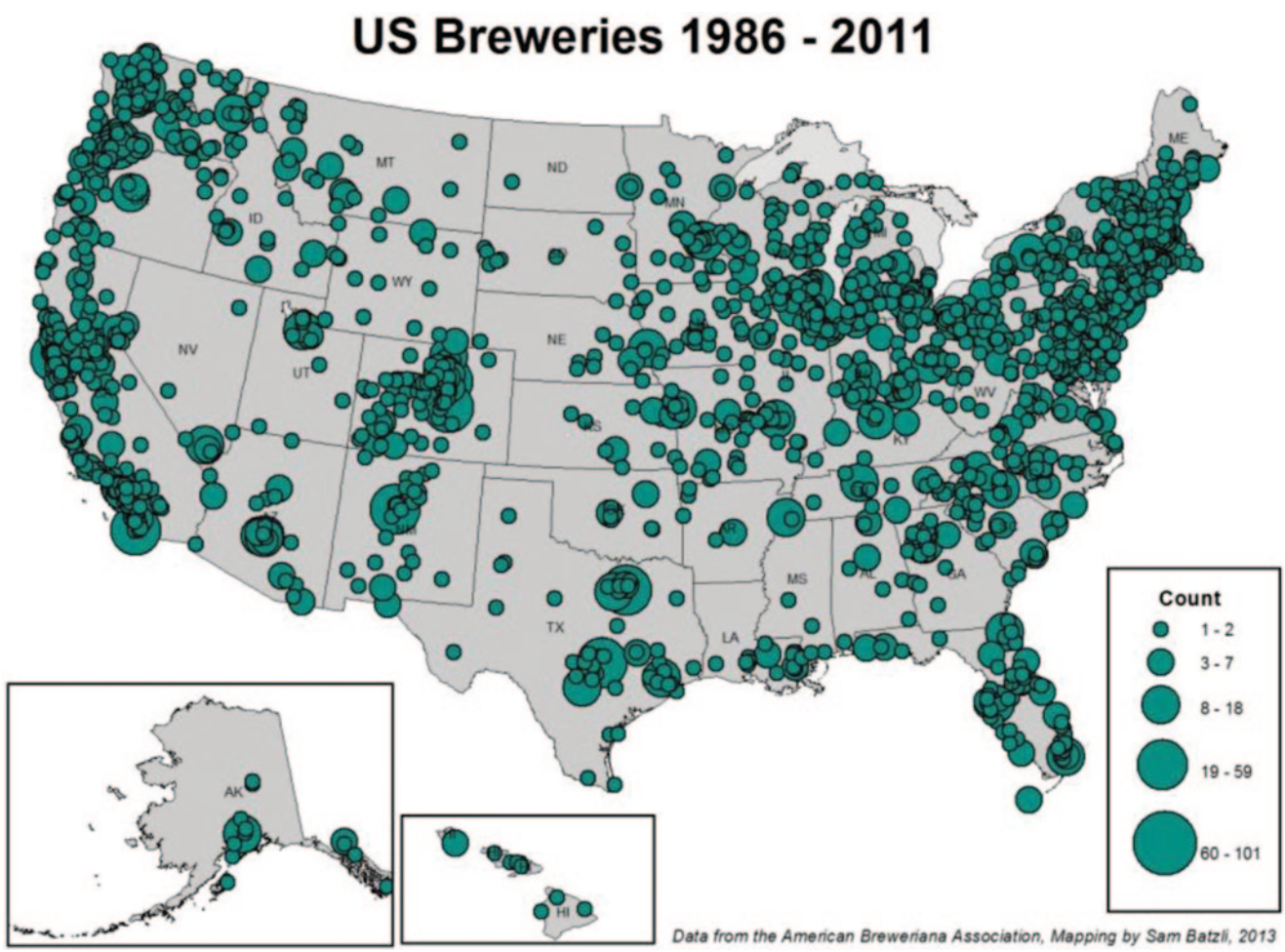

Fig. 4.7 Breweries active between 1986 and 2011. Data from the American Breweriana Association

regional craft breweries. Just less than twenty years later, in the year 2000, the top four producing breweries in the United States still accounted for 94% of the market. Anheuser-Busch (53.4%), Miller (22.6%), Coors (12.5%) and Pabst (5.7%) continued to dominate the market (Yenne 2003). However, the brewing landscape had changed. In that same year, the number of breweries had risen sharply from 84 to 1,602. Nearly all of these new breweries were microbreweries, brewpubs, and regional craft brewers. By 2011 the number stood at 1,990, and their location is significant. Familiar geographic patterns emerged along with striking new ones.

The map for this time period reflects major changes in the distribution of brewing activities in the United States (Fig.4.7). The proliferation of microbreweries and brewpubs augmented existing places but also spread to new areas. The West Coast gained many new breweries with Portland, Seattle, and San Diego entering the top-ten list for the first time (Table 4.6). New areas include the resort towns and tourist destinations of Colorado, and the coasts of Florida, South Carolina, and Maine. Denver and Colorado Springs also appear in the top-ten list for the first time. Vermont had no breweries prior to this time period and by 2011 had more per capita than any other state at 24. Similarly Maine had no breweries in 1985 but 33 in 2011 (Brewers Association 2011).

Table 4.6 From 1986 through 2011, 1,741 different cities supported 3,445 breweries at one time or another during this time period. This is a list of the top ten cities by number of breweries from the ABA Database

Rank	City	Number of breweries 1986–2011
1	Portland, OR	57
2	Seattle, WA	48
3	San Diego, CA	35
4	Austin, TX	25
5	Denver, CO	23
6	Colorado Springs, CO	21
7	New York, NY	21
8	Dallas, TX	21
9	Chicago, IL	20
10	San Francisco, CA	19

Even areas that had few breweries in the past because of state and local legal limitations began to show growth. For example, Mississippi was one of the first states to adopt a legal basis for the temperance movement in 1907 and was the last to repeal its effects in 1966. From 1986 to 2011 Mississippi added only three new breweries to its existing three. Until 1987 Kansas prohibited public bars much less microbreweries (Kansas Legislative Research Department 2003). Now both are legal, and in 2011, 16 microbreweries were active in Kansas (Brewers Association 2011). New Jersey recently modified its microbrewery laws to allow breweries to serve their products on the premises (La Gorce 2013). There are still many dry communities and counties in the United States. Most are concentrated in southern states. Kansas, Mississippi, and Tennessee are entirely dry by default and require counties to authorize specifically the sale of alcohol for it to be legal.

It would seem that the depletion of domestic beer variety in the previous time period stimulated a powerful demand for new options and an interest in locally-brewed craft beers. The craft brew industry continues to grow at a remarkable rate. Today, the variety of brands and styles of beer available in stores, restaurants, brewpubs, and microbrewery tap-rooms across the country is astounding. According to a recent CNN Money article, craft beers nearly doubled their market share from 2007 to 2012. They now comprise 6% of the United States beer market. For the first time, there are more breweries in the United States now (2,286) than there were just prior to prohibition (Rawlins 2013). It may not be too surprising then that contemporary Map 6 resembles pre-prohibition Map 3. Beer brewing appears to have returned to the places where people are living, and for the first time since before prohibition, the location of brewing matters.

Conclusion

Mapping breweries over time shows distinct geographic patterns of the brewing history of the United States. These patterns are strongly correlated with historical themes in US history and provide opportunities for exploration of the relationships among them. Through the maps in this chapter, we have seen the influence early British, Dutch, and Irish settlers. We have seen the arrival of Germans and the shift to lager beers. Up through 1920 beer brewing followed economic expansion and the mining industry, persisted in the industrial North, but remained largely absent in the South. Prohibition paved the way for consolidation of the brewing industry as the expense of variety and regional brands up the 1980s. Mapping brewery locations enhances our understanding of brewing history and our connections to that past.

The ABA database is a rich resource and good starting point for studying the history and location of breweries in the United States, but we have to look beyond the database to understand more about what is really going on with the geography of breweries today and how geography helps us understand the history. With Google search indexing and social media tools like Twitter, it is possible to explore the consumer experience from new and innovative perspectives. For example, one current map of bars derived from Google directory searches (Zook et al. 2010) has remarkable similarities to Map 3 of this study (Fig. 4.4) in the Midwest, Northeast, West coast, and Texas. Comparing the bar map with the ABA database derived map for 1986–2011 shows similarities in Florida, the Gulf Coast and generally a better fit for the South. Suddenly this all makes sense when one considers the nature of breweries during these two different time periods. Breweries during the 1866–1920 were often small town affairs that served a local cliental, similar to a bar. The current craft beer movement includes brewpubs that function in a similar way to their predecessors from the earlier time period and similarly to today's bars. In fact, it may be that many of the bars in the bar map are identical to the brewpubs in the brewery map.

Today two companies (Anheuser-Busch InBev and Miller-Coors) dominate the American beer market and produce "flavor neutral" national brands that are aggressively marketed, but the craft beer movement continues to grow. The geography of breweries today much more closely resembles the number and location from the 1866–1920 pre-prohibition map. But today this old pattern is overlain with new patterns that include coastal and mountain resort destinations. The maps tells us that the industry is changing, and the profusion of new breweries reflects a change in demand. Entrepreneurial brewers are exploring new styles of beer and reviving historical styles. Craft breweries offer a wide range of styles of beer, sampling from the historical tradition of the British and Irish pale ales, stouts, and PIAs, German wheat beers and lagers, but also introducing Belgian styles and inventing their own local or regionally branded specialties. It is common to find new beers with stories behind their styles or names. While brewpubs are offering food, restaurants are offering more local beers. In essence brewpubs and microbreweries are bringing brewing back to the places where people live and drink beer. Or perhaps conversely, people are increasingly drawn to drink beer where it is brewed and are seeking locally produced beer. This leads our brewery map of today to resemble the brewery map of 100 years ago, reflecting an earlier era of village breweries and way houses. And the beer people find in these places today reflects the full spectrum of the rich brewing history of America with the additional creativity of modern brewers.

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Local to National and Back Again: Beer, Wisconsin & Scale

5

Andrew Shears

Abstract

Brewing has been an important part industrialized in the latter portions of Wisconsin's culture and economy since the first settlers arrived in the early 1800s. Like much of the country, Wisconsin brewers experienced a spatial shift in accordance with the industry's technology. Starting with many brewers each serving local markets, developments in beer preservation, packaging and transport allowed certain Wisconsin brewers to seize opportunities for expanded market areas. The enlarged economies of scale achieved by these larger brewers provided a competitive advantage that slowly put smaller operations out of business. By the mid-twentieth century, brewing had largely become a national enterprise with fewer local or regional players. Though its market share remained limited, the craft brewing movement represented a reversal of this trend, both nationally and in Wisconsin. Like the early brewers who had settled the state, these new Wisconsin breweries were focused on achieving an economy of scale by developing a local market of consumers.

Introduction

Beer has been an important part of United States culture since the beginning, and perhaps nowhere is that more true than in the state of Wisconsin. Settled largely by German immigrants in the mid nineteenth century, Wisconsin had a population thirsty for beer from its earliest days. Breweries were established in the region before Wisconsin achieved statehood in 1848 and grew rapidly in number as more of the state was settled. Because of the limitations of packaging and purification technology, brewing at the time had to occur near the site of consumption, meaning breweries were, by necessity, local enterprises—local ingredients, brewed and then poured locally–conditions allowing brewers to create economies of scale within very small geographic areas. Beer production proved so profitable across Wisconsin that the state hosted over 300 breweries by the mid-1880s, with at least one in nearly every community (Kroll 1976; Apps 2005).

When a fire devastated Chicago in 1871, established brewers in nearby Milwaukee were well situated to expand operations and fulfill that market's demand. Combined with advances in packaging and preservation techniques, this enlarged geographic footprint allowed four major Milwaukee-breweries—Pabst, Schlitz, Miller and Blatz—sales necessary to streamline production, improve reliability of product quality, and expand distribution to achieve national prominence. As brewing industrialized in the latter portions of the nineteenth century, breweries in Wisconsin and throughout the United States faced a period of consolidation. With the largest brewers exploiting newly broadened markets, smaller local breweries were unable to compete. Prohibition during the 1920s and 1930s would further transform the brewing industry, eliminating most of the remaining local small-scale brewing companies while positioning surviving brewers for national distribution. The consumer shift from kegged to packaged beer enhanced this distribution channel while further widening the gap between the larger and smaller producers. Most of the smaller local and regional breweries in the United States went defunct during the postwar years, leaving just 80 in the entire country by 1983; Wisconsin was no different, with just seven breweries remaining in the state that year. American beer had scaled

A. Shears (✉)
Department of Geography and Geology, Mansfield University, Mansfield, PA 16933, USA
e-mail: ashears@mansfield.edu

M. Patterson, N. Hoalst-Pullen (eds.), *The Geography of Beer,* DOI 10.1007/978-94-007-7787-3_5,
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to mass consumerism, with the top six brewing companies controlled 92% of all beer production in the United States in 1983, most of which distributed to a national consumer base (Beer Advocate 2012).

During the 1980s and 1990s, the winds shifted again to a nearly reverse direction. While the major breweries still maintained a stranglehold on the national beer market, the 1976 founding of New Albion Brewery marked the beginning of craft brewing, smaller-scale operations serving local customer bases. As craft beer's variety of flavors and recipes became increasingly popular around the country, more so-called "microbreweries"—those with production of fewer than 25,000 barrels annually—opened to cater to this demand. Similarly, Wisconsin brewing experienced a particular renaissance with microbreweries. Joining three smaller brewers that had survived the storm, Glendale's Sprecher Brewing Company opened in 1985, the first of the new wave that includes over 100 breweries now operating in the state. Like the state's earliest small-scale brewers in the mid-1800s, these new breweries strongly focused on seasonal production, local ingredients and local consumption, establishing economies of scale. While historically, Wisconsin brewers' local economic interactions were by necessity for sake of spoilage, today Wisconsin's microbrewers focus locally for high quality ingredients, low distribution costs, and for the attractive if marketable connection to Wisconsin's unique history and place.

Bringing Beer to the Americas and Wisconsin

While indigenous groups had fermented beverages before Columbus, brewing of beer specifically has been practiced on the North American continent since at least 1612, when Dutch colonists Adrian Block and Hans Christiansen founded a brewery in New Amsterdam (Apps 2005; Beer Advocate 2008; Janik 2010). The first British brewery in the New World quickly followed in 1613, when the London Company established a brewery in Jamestown to supply the demand of colonists angered by poor quality of imported beer (Baron 1962; Apps 2005). From these beginnings, brewing beer was strongly intertwined into European-North American culture. As the continent was conquered by waves of European colonizers and later American and Canadian migrants, beer production spread hand-in-hand with settlement.

Emergence of local breweries in small American frontier settlements was a reality of beer storage and distribution technologies of the time. Until pasteurization and bottling were perfected in the second half of the nineteenth century, brewers were limited to preserving their beer in containers using only primitive sealing hardware, and shelf lives were short. Casks or kegs, not bottles, were the preferred method of storage, making transport of finished product cumbersome (Kroll 1976). Shipping beer across the Atlantic was not feasible; Jamestown's colonists had demanded a brewery because imported beer had arrived spoiled, poisoned or otherwise undrinkable. By the time of the American Revolution, rejecting imported English malt liquors and ales in favor of beer from a local colonial brewer, or even home brewers, had become a patriotic act (Baron 1962).

Beer's prominence declined when whiskey, chosen for its efficient use of surplus grain and its potency, became the preferred alcoholic beverage of Americans crossing the Appalachians. Finding a beer-drinking American who spoke English in the 1840s was a very difficult task. Brewing would return to the forefront of American culture when a massive wave of German immigrants came to the United States, seeking personal freedom and economic opportunity through ownership of family farms. Seeking the cheap and plentiful land of the American frontier, these Germans largely came to the Northwest Territory, incorporated by the federal government in 1787 to organize settlement of lands south of the Great Lakes and north of the Ohio River, from Pennsylvania west to the banks of the Mississippi. As German immigrants established farms and populated the region, the Northwest Territory was partitioned into new states: Ohio, Indiana, Illinois, Michigan, Wisconsin, and part of what would become northeastern Minnesota. Because beer was the preferred drink of these German settlers, a demand for suds followed these immigrants to the American frontier. Unlike the earlier American immigrants and their descendants, people of British heritage who preferred ales, the Germans brought a thirst for a beer unfamiliar to Americans of the time: lager (Baron 1962; Ogle 2006; Knoedelseder 2012).

This new preference for lagers further complicated the geography of brewing in the mid-1800s. Early German-American brewers of lager were limited in both mobility and seasonality of their production, meaning this beer had to be brewed near the point of consumption. Beer was so demanded by these settlers farmers too far from breweries of the day resorted to brewing their own at home, much like they created their own soap and bullets (Apps 2005). Unlike ales, which could be prepared in a matter of days with simple equipment, lagers required significantly more patience and investment. The process for brewing lagers at the time required two to three months of "resting" so yeast and other solid ingredients could sink to the bottom of the barrel. This resting needed to take place at near-freezing temperatures, which in the age before refrigeration meant storage in underground caverns (Apps 2005; Ogle 2006), and only during seasons where ice was readily available (Hachten and Allen 2009).

To fulfill this new and growing demand for lager, the settlers began breweries in communities dotting the entire region, brewing lagers for local consumption. As Ogle (2006, p. 16) notes:

> the 1840s were a time of few roads or rails and reliable cold storage was limited to underground caverns. A lager brewer sold nearly all of his beer within a mile or two of his brewhouse, cultivating the goodwill of nearby tavern owners, Germans for the most part who had set up shop in order to supply beer to other immigrants.

Breweries were dispersed throughout the Midwest by necessity. Early American brewers were engaged in a classic example of market-oriented manufacturing, locating production close to the point of sale to avoid issues with transport and spoilage of product. Brewing remained a largely market-oriented manufacturing activity through much of the nineteenth century because the production process had implied costs; most of the brewers had to be located near the point of consumption to be profitable. By adding water to grain, brewing beer not only increased the bulk of the ingredients and raised transportation costs, but because preservation methods remained unperfected, it also began the clock on spoilage. In essence, American brewers faced the same extraordinary potential opportunity cost that had ruined imported British ales during colonial times (Baron 1962). Because beer was difficult and expensive to transport, and the constant threat of spoilage lingered, early breweries were limited to producing small volumes and reaching only very local markets (Smith 1998). With settlement spreading beer consumers throughout the Midwest, thousands of small breweries were established in the region by the mid-nineteenth century to fulfill demand, many by German immigrants (Kroll 1976). The federal government recorded a total of just 132 breweries in the entirety of the United States in 1810. By 1850, reflecting the impacts of the German in-migration, there were 431; by 1860, there were 1,269 and by 1873, the population of breweries in the United States peaked with 4,131 active brewing operations (Van Munching 1997). Each of these breweries were dependent upon their local markets, with nearly every farm market town in predominantly German areas featuring at least one brewer (Fig. 5.1).

Germans founded each of the early breweries that rose to prominence in the United States. Adolphus Busch settled in St. Louis in 1857 and four years later, married the daughter of Eberhard Anhueser, a brewer whose beer had long suffered from quality problems. After buying the brewery from Anheuser in 1865, Busch experimented with the brewing process; in 1876, the Anheuser-Busch Company began brewing a Bohemian recipe he called Budweiser (Knoedelseder 2012; Ganey and Hernon 2012). Another brewer, a Prussian immigrant named Adolph Coors, settled in Denver in 1873 and built the Coors Brewing Company, which would later achieve dominance in the western United States and become a national brand (Van Munching 1997).

Wisconsin's brewing history, which predates its 1848 statehood, was likewise driven by the arrival of German immigrants. Some sources, and local folklore, suggest that two breweries—one in Elk Grove, another in Mineral Point—were operating before 1840, but this remains unconfirmed by historians (Janik 2010). Well suited to the state's climate, hops are believed to be the first crop grown by American settlers in the state (Hintz 2011). Oddly enough, Welsh immigrants Richard Owens, William Pawlett and John Davis began the state's first documented brewery in 1840. The three men built a five-barrel brew kettle out of a copper-lined wooden box and created the Milwaukee Brewery, a company that remained in business until the 1880s (Kroll 1976).

Probably the most important brewer early in Milwaukee's history was Jacob Best, a German who had settled there in 1841. Best and his four sons profoundly impacted the future of brewing, not only in Milwaukee, but for the entire United States. In 1842, Jacob founded the Best and Company brewery, running it until his retirement in 1853, when son Philip took over and renamed it the Philip Best Brewing Company. In 1862, Philip Best's daughter Maria married German flatboat captain and brewer Frederick Pabst, who would buy half of the company from his father-in-law two years later. After Philip Best died in 1867, the brewery would continue its success under Pabst's leadership, renamed Pabst Brewing Company in 1889 (Cochran and Collins 1948, 2011; Apps 2005; Pabst Mansion 2012). This brewery was not the family's only impact on Milwaukee brewing. Two of Jacob Best's other sons, Jacob Jr. and Lorenz, left Best and Company in 1850 to start the Plank-Road Brewery in Milwaukee. In 1855, the brothers sold Plank-Road to Frederick Miller, another German immigrant who would later find a measure of success in the brewing industry (Van Munching 1997; Shepherd 2001; Apps 2005).

What made brewing such a lucrative industry in Wisconsin for families like the Bests, Pabsts and Millers was the tremendous local demand. Beer was tremendously popular among the German-American immigrants, who were mostly farmers in the Wisconsin countryside. To achieve any measure of success, brewers had to establish an economy of scale in the local market because transport was so difficult. Brewers of mid-nineteenth Century simply could not effectively serve a large area; beer's rapid spoilage and the era's limited speed of transportation allowed each brewer to serve only a very compact market area. With these transport limitations, the only way to fulfill the demand of this spatially expansive group of consumers was to have many breweries dotting the state. While neighboring states had their share of breweries, Wisconsin had many more; by 1860, Wisconsin hosted nearly 200 breweries, with over 40 in Milwaukee alone (Janik 2010).

The immigrants who populated the state brought with them a German culture in which breweries and beer were integral parts of community life. Janik (2010, p. 89) argues that "[b]reweries were as much a part of the state's communities as churches or schools." Entire towns in Wiscon-

Fig. 5.1 Location of Select Wisconsin Breweries, 2013

sin were built around established breweries, just like they were around churches and schools, as German immigrants settled the frontier. Beyond obviously providing beer and its related social benefits, brewers sponsored community events and charities, provided employment opportunities, and were reliable customers of local farmers' produce (Janik 2010; Hintz 2011). Kroll (1976) noted that this reliance on local ingredients greatly influenced brewing recipes among these early brewers, with many beers produced only seasonally to account for availability of ingredients.

Milwaukee had so many breweries that, by 1870, the city's beer supply completely outpaced demand. High turnover on the brewery scene was common, and many that opened during this period were in business few years. Be-

cause reliable containment had not yet been developed, shipping the beer to distant markets remained unfeasible, leaving brewers to fight only for the local demand (Kroll 1976). The city's brewers needed to expand their market area to new consumers, but until the industry dramatically changed, they faced impossible spatial barriers to achieving this.

New Developments for a Dynamic Economy of Scale

Oversaturation and limited distribution area would not concern Milwaukee's brewery owners for long, thanks to a wayward lantern kick from a mythical bovine. Though the newspaper story that blamed the Great Chicago Fire of 1871 on Catherine O'Leary's cow was fabricated, the inferno that resulted was real enough to destroy most of the bustling city just 80 miles south of Milwaukee (Janik 2010). The blaze destroyed many of Chicago's local breweries and damaged its water supply, which combined with the city's thirsty predominantly German population, created a new demand for beer brewed elsewhere. The close proximity to Chicago's charred ruins and the water route Lake Michigan provided between the two cities allowed Milwaukee's brewers to enter this newly opened lucrative market (Moran 1962). Even without effective packaging, the short relative distance meant Chicagoans could drink beer brewed in Milwaukee while it was still fresh, and that Milwaukee's brewers could claim a far larger market area earlier than brewers located elsewhere (Kroll 1976).

It was Chicago's demand for beer that allowed several Milwaukee breweries establish a new, larger economy of scale that would later provide the income necessary to establish to national prominence. An upstart Milwaukee brewer, Joseph Schlitz of Schlitz Brewing Company, seized the opportunity to quench the thirst of Chicagoans by flooding the city with his beer. Schlitz's longtime slogan—"the Beer That Made Milwaukee Famous"—was adopted during this period as a reference to the brand's, and the city's, new wider market (Van Munching 1997; Hintz 2011). Pabst also took advantage of Chicago's misfortune, capitalizing on its expanded market to become the country's largest brewery in 1874 (Cochran and Collins 1948, 2011). However, to expand any further, Milwaukee's beer industry needed several important technological advancements.

As Milwaukee's brewers expanded to the Windy City, industry-shifting progress in brewing technology was taking place on the other side of Illinois. In St. Louis, Adolphus Busch had been following the continuing work of French scientist Louis Pasteur and his efforts to prevent rapid spoilage of beer. Because the ongoing Franco-Prussian War severed the beer supply coming to France from German brewers in 1870, Pasteur sought a way to improve the quality of French brews. In 1875, he determined that by steaming his beer, slowly heating containers to 170 degrees Fahrenheit by subjecting them to a steam bath, he could eliminate the spoilage-causing bacteria that hitchhiked into beer when yeast was added (Kroll 1976). Busch was quick to adopt Pasteur's process; by the time Budweiser was introduced the next year, all Anheuser-Busch beers were pasteurized before shipment (Van Munching 1997). By being the first major brewer to adopt pasteurization, Anheuser-Busch seized a crucial advantage by brewing beer that remained unspoiled longer, allowing effective distribution far from the point of production for the first time (Van Munching 1997; Knoedelseder 2012; Ganey and Hernon 2012). In Milwaukee, the Philip Best Brewery was the first to adopt pasteurization beginning in 1878, and soon thereafter began shipping kegs of its beer globally. Its wide-reaching distribution gained the company such a following that, when it was renamed the Pabst Brewing Company in 1889, it was the largest brewer in the world.

A perfected pasteurization process set the stage for another of Busch's improvements, a revolutionary change in beer sales and distribution. One change he initiated was to construct a network of taverns owned by the brewery, where his products would be sold exclusively. By implementing this vertical integration strategy for the Anheuser-Busch Company, Busch managed to cut costs by eliminating the "middleman," which meant the company's beers were priced cheaper than its competitors (Knoedelseder 2012; Ganey and Hernon 2012). To solidify this edge, Busch launched a new kind of beer marketing, printing posters and displays for the company taverns, and purchasing various trinkets with logos of various Anheuser-Busch brands, to be given away to customers (Ganey and Hernon 2012). To supply his taverns and to expand his market, Busch then combined his beer's newly extended freshness with the speed and efficiency of rail transport to expand his market area widely; because of St. Louis's location central to the U.S.'s rail network, the Anheuser-Busch Company was able to ship Budweiser and other beers to distant consumers (Knoedelseder 2012; Ganey and Hernon 2012). Like pasteurization, this model was one that Busch adapted from elsewhere; he had seen Canadian brewer Molson use rail to achieve a wide market in Ontario as early as the 1860s (Ganey and Hernon 2012; Van Munching 1997). Busch added a new wrinkle to Molson's model, though, as the advent of early refrigeration rail cars allowed his beer to stay even fresher for longer. As an early adopter, Anheuser-Busch used this combination of technologies and business models to achieve broader prominence earlier than its competitors (Van Munching 1997). By exercising this crucial advantage and expanding markets domestically, Anheuser-Busch grew from being the 32nd largest U.S. brewer in 1877 to one of the ten largest in 1890, and propelled Augustus Busch into fantastic success, making him St. Louis's wealthiest resident (Ganey and Hernon 2012). Seeing An-

heuser-Busch's success in this enterprise, Milwaukee breweries like Pabst, Schlitz and Blatz all followed this model as well, establishing a network of taverns and distribution agencies throughout their domestic market territories. Like Anheuser-Busch, the Milwaukee breweries were well-connected to the rail network, and were able to minimize the St. Louis operation's advantages through direct competition, retaining their prominence (Kroll 1976; Van Munching 1997).

Pasteurization, company taverns and rail transport were not the only major developments in brewing during this crucial period. In Denmark, biochemist Emil Christian Hansen determined that yeast itself, which Pasteur had rightly blamed for bringing bacteria into beer, could actually be harmful to the fermentation process if certain types of the fungus were present in the batch. In 1883, Hansen developed a pure yeast culture and introduced it to the Carlsberg Brewery, with incredible results. The pure yeast brought the best possible fermentation, vastly improving both the reliability of the brewing process and the finished product's consistency (Kroll 1976). American brewers adopted pure yeast even more quickly than they had pasteurization; that same year August Uihlein, heir to the Schlitz brewery, went to Copenhagen to purchase some of Hansen's yeast culture. By 1887, the largest breweries—including Anheuser-Busch, Schlitz, Philip Best/Pabst, Blatz, Miller and others—all used pure yeast cultures in their fermentation processes (Kroll 1976; Van Munching 1997; Knoedelseder 2012). Smaller breweries that had not established a larger economy of scale could not afford the scientific equipment necessary to maintain this yeast culture stuck to older family recipes with less reliable results, ultimately earning a reputation for poor quality that would exacerbate their later demise (Kroll 1976).

These developments were important pre-conditions for another advancement in brewing: use of bottles for packaging. Though Anheuser-Busch was experimenting with bottling in the 1870s to save cost during the pasteurization process, brewers used bottles sparingly until two decades later. Spoilage issues, federal regulations regarding taxation of beer, and ineffective capping mechanisms for bottles, hampered wide adoption of bottling. It might seem backwards that bottling came after pasteurization; however, the elimination of bacteria was absolutely necessary before this development in beer packaging could occur. Before pasteurization to extended beer's shelf life, harmful bacteria would cause a sealed bottle of beer to spoil in just a few days (Kroll 1976). Brewing regulations of the time, in place to levy taxes on beer, further hampered the economic feasibility of bottling. Until 1890, federal law prohibited brewers from bottling on the premises of their brewing operation. Breweries were allowed only to fill kegs, the established base unit of volume, so tax collectors could calculate volume produced simply by counting the number of kegs filled. Then, after the kegs were accounted and marked as taxed, brewers who wished to bottle beer had to transport these bulky containers to a separate facility to fill bottles, an additional cost both in moving the goods, but a delay that cost time during which the beer was fresh (Baron 1962; Kroll 1976; Van Munching 1997; Knoedelseder 2012). Only through the lobbying efforts of the powerful Pabst Brewing Company was the law changed in 1890.

Though state law still required brewing and bottling operations to occur in separate buildings, Pabst was allowed to build a gauged pipeline connecting its brewery to its bottling plant, allowing measurement of production for taxation while substantially lowering costs for bottling, a model immediately adopted by other breweries throughout the country (Cochran and Collins 1948, 2011). Bottling was finally made feasible in 1892 by the introduction of the crown cap by Crown Cork and Seal Company of Baltimore. Before the crown cap, plants used a number of unreliable methods for sealing bottles, including cork and wax. The older sealing methods would often fail, ruining the beer by losing the seal and allowing beer to go flat, or by exploding under the pressure of carbonation. The crown cap was the first reliable beer cap avoiding both of those shortcomings, a design which is still used today. Though bottled beer would not be popular with consumers until after the end of Prohibition—only about 20% of all American beer sales by volume were packaged in 1900—the crown cap was the final ingredient for making bottling, and therefore the development of national distribution networks, economically feasible (Kroll 1976; Knoedelseder 2012).

Big Beer Gets Bigger, and Smaller Breweries Disappear

Wisconsin would continue to lead the country in beer production, but the geography of that production had shifted dramatically. The numerous developments in brewing, bottling and sales that greatly benefited the larger Milwaukee breweries like Pabst, Schlitz, Blatz and Miller—Milwaukee's "Big Four"—were also changes that left many smaller breweries behind. The large brewers were able to capitalize on their improvements to the efficiency of the brewing process by producing more beer for a lower cost, undercutting prices of their competitors. Smaller breweries remained unable to afford equipment necessary maintain a pure yeast colony or to pasteurize their beers, and their quality relative to the larger brewers suffered in comparison (Van Munching 1997). The economies of scale achieved by these local brewers were, by definition, small in both area and profitability; though the small brewers could carve out a living with these local markets, they were not becoming wealthy by practicing their craft and did not have extra capital to invest in improving production. These tiny economies of scale were certainly unable to withstand new competition from the better-funded breweries that invaded these smaller markets, spending lav-

ishly on advertising campaigns to promote the more reliable quality of their cheaper beer. Expansion of larger breweries into new territories spelled the end of the local breweries serving every community. Suddenty, breweries were no longer spread throughout small settlements dotting the state but were instead concentrated in the larger cities.

The impact of this shift on Wisconsin's brewing landscape was profound. As the local brewers scattered throughout the state faced unprecedented competition from larger operations, particularly from those in Milwaukee, many folded or were swallowed by larger companies before the close of the nineteenth century. Kroll (1976) suggests that Wisconsin's brewery population peaked around 1880, with over three hundred operating at times, with as many as fifty operating in the city of Milwaukee. This was the peak of the local brewer, before the technological improvements led to a market invasion from larger competitors. By 1900, as companies closed and consolidated in beer's new economic climate, only 135 breweries remained in the state (Apps 2005). Suddenly, an overwhelming portion of beer produced in Wisconsin originated from a handful of very large breweries and brewing companies, located mostly in Milwaukee, with the remaining production coming from the shrinking number of smaller breweries found scattered in communities across the state.

Now, the larger Wisconsin breweries were competing not with the small local operations, but with the larger national players. Oddly enough, Wisconsin offered relatively few location-specific competitive advantages for its brewers to achieve success in a national market. Early on, access to locally grown grain and hops provided cheap ingredients to brewers, but the long-term impact of local crops was limited. Shortly after statehood in 1848, Wisconsin had become the country's breadbasket, leading the United States in the production of wheat, barley and other grain. By the beginning the Civil War just a short time later, however, depletion of the soil's nutrients and increased competition from new farms in Minnesota and Iowa had driven most of Wisconsin's farmers out of grain production and into the dairy industry (Kroll 1976; Apps 2005). Though the climate is ideal for growing hops, cultivation of the cropin Wisconsin followed the same trajectory as wheat; after being one of the first crops planted in Wisconsin by American settlers, the state's hops production increased exponentially until a flooded market caused prices to collapse in 1867. The collapse, during which the market rate for hops dropped from 60 cents per pound to just five cents per pound, ruined the financial viability of many hops-growing farms and drove even more farmers to the relative stability of dairy farming (Apps 2005; Ogle 2006). The loss of large-scale local grain and hops production required Wisconsin brewers to purchase ingredients from suppliers in other states, eliminating this brief advantage.

No amount of cheap ingredients could match Wisconsin's biggest advantage for breweries: its substantial local market of beer drinkers. Milwaukee's Big Four, as well as the smaller brewers who found modest success, first achieved an economy of scale from the incredible local demand from Wisconsinites of German ancestry. By embracing the local market, brewers were able to build profitable enterprises on a smaller scale. Brewers could then invest their profits in more efficient brewing equipment with larger capacities, transport and preservation of the beer, and marketing to consumers beyond the traditional reach of the brand. This continual demand from German immigrants not only provided an economic space where breweries initially dotted the Wisconsin landscape, but the economic stability necessary for successful brewers to expand their market areas to larger scales. As the countless new technologies developed at the end of the nineteenth century allowed the Big Four, along with the likes of Anheuser-Busch and Coors, to take their brands to a larger audience, commercial brewing saw an industry-wide shift to larger-scale production, wider spatial extent of consumers, and fewer players.

Expansion Brings Consolidation, Prohibition Leaves Destruction

As smaller breweries around the country began to go out of business, some brewers decided to merge with other companies to share resources in competition with the new giants. By 1910, only 1,568 breweries remained, just one-third the number that had been in operation at the peak some 37 years earlier; but, production was up from nine million barrels in 1873 to 53 million (Baron 1962; Van Munching 1997). Small breweries were unable to compete in terms of price and marketing, and many consolidated with each other to share resources in competition against the larger players. This was not a phenomenon limited to Wisconsin; for example, Pittsburgh's 36 breweries in 1900 had consolidated to just two by 1910 (Van Munching 1997).

Beyond consolidation, brewing in the United States faced another challenge at the beginning of the twentieth century, thanks to the religious and political climate of the United States: the growing Temperance Movement. Though Temperance had been a political force in the United States since the early-1800s, the movement really gained momentum with the advent of the First World War. Even before American involvement in Europe, the war stoked much anti-German sentiment among the American public, and it was the brewers who felt the wrath. It no longer helped sales to be a proud German; August A. Busch, heir and now owner of Anheuser-Busch in St. Louis, was a strong supporter of the Kaiser early in the war and his wife Lilly spent the war in Germany as a show of loyalty, both facts that consumers long remembered. Sales of Anheuser-Busch beer plummeted

as public opinion shifted against Germany, first for pioneering poison gas in warfare, then for sinking the U.S.'s ship, the Lusitania. By the time the United States entered the war in 1917, anti-German sentiment was a major threat not only to the German brewers, but the millions of Americans with who were German immigrants or claimed German ancestry. It was in this social climate that the Temperance Movement gained serious traction in mainstream American politics.

In Wisconsin, the tension was heightened, not only because of the brewing industry's importance to the state's economy, but because Wisconsin had become a center for temperance supporters. Janik (2010) notes that the war heightened an existing divide between two groups in the state: the temperance movement, largely led by rural Christian Protestants of British descent, and the largely urban Roman Catholic German-American brewers and beer drinkers. As hostility and oppression against German people and culture grew, many communities in Wisconsin founded local German heritage societies, organized during the war to defend their civil liberties. Heavily bankrolled by brewers, these societies ultimately alienated Wisconsin German-Americans, and the breweries they owned, from the larger public.

Though several states, including Iowa, North Dakota and Rhode Island, and a number of counties had gone "dry"—meaning the sale of alcohol was legally prohibited—attempts to eradicate alcohol on a national scale had largely stalled through the first two decades of the twentieth century. However, American involvement in the war had amplified the calls for temperance, as Van Munching (1997, pp. 19–20) observed:

> [t]hose [anti-German] feelings, coupled with protestant moralism and its attendant fear of rampant immigration, would help the temperance movement achieve its ultimate goal: national prohibition.

American involvement in the First World War ultimately pushed prohibition over the top. The U.S. Congress voted to declare war on Germany and its allies on April 6, 1917; by August 1, a Prohibition amendment to the U.S. Constitution had passed the Senate, approved by the House of Representatives on December 17, and then passed to the states for ratification on December 18. The proposed amendment did not prohibit consumption or possession of alcohol, but made it very difficult for citizens to obtain them by outlawing production, sale, transport, or import of such beverages:

> After one year from the ratification of this article the manufacture, sale, or transportation of intoxicating liquors within, the importation thereof into, or the exportation thereof from the United States and all territory subject to the jurisdiction thereof for beverage purposes is hereby prohibited.
>
> -18th Amendment to the United States Constitution, Article I

Ratification of a constitutional amendment in the U.S. by states is usually a years-long process, and though Prohibition implemented quickly by these standards, the process still outlasted the war. By the time Nebraska became the 36th state to ratify the proposal on January 16, 1919—bringing the legislation past the threshold of three-quarters of states required for federal ratification and implementation—Armistice in Europe was already in its third month. The Volstead Act, a piece of legislation accompanying the 18th Amendment designed to detail its enforcement, established the date of January 17, 1920 as the beginning of Prohibition in the United States.

The impact on the economy of American brewing was swift and brutal. Breweries across the country closed en masse. Some facilities were converted to other uses as brewing companies sought new revenue flows. With mixed results, Anheuser Busch, Pabst and Stroh's tried producing soft drinks and "near beer" beverages with less than 0.05 % ABV to qualify for the Volstead Act's definition of non-intoxicating beverages. Blatz adapted its brewery to produce alcohols for industrial purposes, while Schlitz used its brewing facilities during Prohibition to produce candy. Though the former brewers found relatively little demand for their new products, shifting emphasis to other industries gave these companies the cash flow needed to ultimately last through the Prohibition (Brunn 1962).

Survivors were the exception: with their main product now illegal to produce, many brewers simply closed their businesses, liquidated their now largely worthless equipment, and sought new opportunities. In Wisconsin, at least 54 breweries that had been open in January 1920 were permanently shuttered a year later. At least eleven of these breweries, such as Joseph Hussa (Bangor), Farmer's (Beaver Dam), Hausmann (Madison), William Rahr & Sons (Manitowoc), Menasha, New Lisbon, Gutsch (Sheboygan), K. Schreier (Sheboygan), Mueller (Two Rivers), Ruder (Wausau) and West Bend had been producing beer since before 1860. While many of these breweries that closed were in decline, losing considerable market share to the larger producers during the first two decades of the twentieth century, it was Prohibition that finished them off (Kroll 1976).

The Beer Bubble, World War II, and Post-War Consolidation

Proving deeply unpopular, the American experiment with temperance ended on December 15, 1933, when the 21st Amendment was put into effect to fully repeal Prohibition. The news caused something of a "gold rush" in the brewing industry, as the larger breweries rushed to get their mothballed equipment back online. In addition to the larger brewers resuming production, some 30 new breweries started operation in Wisconsin during those last 15 days of 1933. These new breweries were less the continuation of brewing tradition of years past and instead were representative of a

sensed opportunity; many were started by businessmen with no beer production experience, but who had bought into the brewing industry by purchasing equipment from those brewers who liquidated during Prohibition. Starting fresh against the machinery of the larger brewers, with no brewing experience, with an economy in the depths of the Great Depression, and often in locations with limited potential for carving an economy of scale within a now-nationally scaled brewing industry, these new brewers had little chance for success. In Wisconsin, fewer than half of the 30 breweries opened in 1933 survived the decade, and none of the 44 breweries founded in the between 1933 and 1945 exist today. Breweries established earlier were not immune to these problems; facing poor economic conditions and increased crunch from competition of the larger brewers, some 33 of the 71 Wisconsin brewery companies that had survived prohibition were defunct by 1950 (Kroll 1976; Apps 2005).

Economic restructuring in the brewing industry were not the only changes to American beer culture during this time. In the period following Prohibition through the end of World War II, U.S. sales of packaged beer surpassed kegged beer for the first time. The large networks of company taverns established by Anheuser Busch, Pabst, Schlitz and others were largely liquidated during Prohibition, leaving third-party saloons and taverns as the primary remaining—and less profitable—market for kegged beer, making bottling far more attractive to brewers as well. Prior to Prohibition, bottled beer accounted for just 18% of beer sold in the United States; by 1934, 25% of American beer was packaged, a number that would grow to nearly 60% by 1942 (Kroll 1976).

With a new eye toward packaged beer sales, container costs became especially important. Canned beer, a far cheaper and more efficient packaging, made its debut in 1935 when the Continental Can Company perfected the canning process as a solution to broken bottles and light-caused spoilage (Van Munching 1997). Canned beer represented some 10% of beer packaged in 1941, before the war effort limited metal supplies available for canning.

Despite this and other occasional packaging shortages, World War II didn't provide nearly as many challenges to brewers as had the First World War. Though Germany was still an enemy, brewers were not singled out for sharing that heritage; many of the brewers by this point were either American-born children or grandchildren of the German founders, or businesspeople otherwise uninterested in German culture. Still smarting from wide disdain endured a generation before, the brewers very publicly contributed to the war effort, many pledging 15% of their beer production to military (Van Munching 1997).

After the war, brewers scrambled to expand their markets throughout the country as it experienced unprecedented prosperity. Schlitz and Anheuser-Busch, the largest and second-largest brewers in the United States, pushed for a larger national footprint through purchasing existing breweries and building new facilities (Van Munching 1997). The two companies were constantly jockeying for competitive advantage, each following the other's expansion into new territories, using increasingly aggressive marketing to grab more sales. Anheuser-Busch's established network of rail transport positioned the brewer with a distinct advantage as it began national distribution of Budweiser, Michelob and Busch. In 1957, Anheuser-Busch ultimately surpassed Schlitz as the largest beer producer in the United States, a position it has maintained to present (Ogle 2006; Knoedelseder 2012; Ganey and Hernon 2012). Pabst, now the third largest brewer, attempted to remain competitive with Anheuser Busch and Schlitz by purchasing Blatz, a fellow Milwaukee-based brewery and the eleventh largest in the country, in 1958 (Kroll 1976; Apps 2005; Pabst Mansion 2012).

As the larger brewers expanded their brands to national distribution and consolidated operations, smaller breweries were put into an increasingly tight financial situation. The larger brewers were establishing a new economy of scale that allowed them to produce large quantities of beer at a very low cost. The beer's cheap price was unmatchable by the smaller breweries, which found demand for their products dwindling. The high margins achieved on these mass-produced beers brought large profits, which were then invested into national advertising campaigns that provided another impossible advantage over the smaller producers.

Though Anheuser-Busch's position as largest brewer in the United States was unchallenged the brewery's sales growth outpaced its competitors, Wisconsin remained the largest beer-producing state, by virtue of hosting the second (Schlitz), third (Pabst), seventh (Miller) and ninth (G. Heileman) largest breweries in the United States (Van Munching 1997). Three other Wisconsin breweries, all much smaller than these four, survived the crunch: Joseph Huber Brewing Company in Monroe, Jacob Leinenkugel Brewing Company in Chippewa Falls and Stevens Point Brewery in Stevens Point (Kroll 1976).

Though the wholesale destruction of local brewing in Wisconsin was mostly complete by the 1975, the landscape of Wisconsin's brewing industry was in a state of flux, even amongst the big breweries. The 1970s would see the rapid decline of two of Milwaukee's Big Four, as Schlitz and Pabst began their slide to obscurity, while Miller would suddenly catapult to national prominence. Another Wisconsin brewing company, G. Heileman, would take advantage of the industry's continued consolidation to quietly rise to the third largest American brewer by piecing together a network of regional breweries.

Despite an established national distribution and production network, Schlitz's market share collapsed between 1970 and 1980. Part of an ill-fated attempt to lower production costs in competition with Anheuser-Busch, Schlitz executives had used cheaper ingredients that dramatically lowered

the quality of the beer, resulting in several embarrassing public relations fiascoes through the decade. By 1982, Schlitz was purchased by Michigan's Stroh Brewery Company and largely ceased to exist (Van Munching 1997; Apps 2005).

Pabst's decline was more gradual. The company's modest expansion strategies in the post-war years—the company's most aggressive move was the purchase of Blatz in 1958—left the brewery with limited liquid capital and limited efficiency relative to its competitors in Anheuser Busch and Miller. Lacking the cash to compete in a national marketing war, Pabst saw a slow slip in its market share through the 1970s (Van Munching 1997), and would continue to fall further behind as expensive television advertising became the price for competing nationally.

Miller, however, followed the opposite trajectory of its Milwaukee brethren and expanded rapidly after cigarette manufacturer Philip Morris purchased the brewery in 1970. Because the company had many other profitable products, Philip Morris was able to patiently invest to gain a toehold in brewing. Within two years of its purchase, the company had taken Miller to national distribution, spending heavily on national advertising campaigns (Apps 2005). However, Miller's good fortune was cemented with its 1972 acquisition of Meister Brau, a small Chicago brewery which the year prior had developed the first "health-conscious" beer, Meister Brau Lite. Though sales of this healthy beer had been difficult under Meister Brau, Philip Morris used the perfect marketing strategy to bring their new acquisition to the masses (Van Munching 1997). Repackaged by Miller simply as "Lite," Philip Morris aggressively promoted the beer as "macho," ingeniously labeling it as "less filling"—meaning, its drinkers can consume and get drunker before overwhelming their digestive tracks—and hired a number of star athletes to endorse the brand (Van Munching 1997; Apps 2005).

- Another Wisconsin company, LaCrosse-based G. Heileman Brewing, had managed to become the third largest brewer in the United States by 1980 using a completely different strategy than Miller. Instead of taking its products national, G. Heileman came to prominence behind its collection of many regional brands gathered either via acquisition of established breweries or arranging licensing deals for Canadian beers:
- Old Style Beer, a G. Heileman original recipe which had gained popularity in the upper Midwest since its 1902
- Blitz-Weinhard, based in Portland, Oregon
- Falls City Brewing Company and Weidieman Brewing Company, both based in Louisville, Kentucky
- Grain Belt brewery, based in Minneapolis and Hamm's based in St. Paul
- National Bohemian Brewing Company, based in Baltimore, Maryland
- Olympia Brewing Company and Rainier Beer, both based in Washington state
- Lone Star Brewing Company, based in San Antonio
- Milwaukee's Blatz beer, acquired from Pabst in 1968
- Drewry's, a Canadian beer brewed for American drinkers in South Bend, Indiana
- Carling's Black Label, a Canadian beer brewed for American drinkers in Cleveland, Ohio.

Heileman's rise would prove short-lived, because American beer production was again shifting. Now that the large brands had expanded nationally and eliminated many of the regional and local brewers from competition, a frontier of sorts had closed. Van Munching (1997, p. 28) observed that by 1980, the national reach of brands like Anheuser-Busch's Budweiser, Miller's Lite and Pabst Blue Ribbon, "[g]rowth for the biggest brewers could no longer come from expanding distribution geographically," but instead "would have to focus on market share." Indeed, in 1983, some 92% of beer production in the United States came from just six breweries—Anheuser-Busch, Miller, Heileman, Stroh, Coors and Pabst—leaving very little room to find new markets (Beer Advocate 2012). The result would be an all-out war between the major breweries for American beer drinkers, largely fought with television advertisements while each brewery's beer suffered from a continual decline in ingredient quality and heightened flavor-killing pasteurization processes, all to cut costs.

The Modern Crunch, and the Rise (Return?) of the Micros

While the major breweries spent tens of millions of dollars on advertising to coax market share from the others' customers, the scale of American brewing was about to shift again with the beginning of craft beer heralded by the founding of the New Albion Brewing Company. While stationed in Scotland with the U.S. Navy in the 1960s, McAuliffe had been exposed to a variety of beers and ales largely unseen in the homogenized beer culture in America, which led him to learn brewing. When he returned to the United States in 1968, McAuliffe attended college and worked in the San Francisco Bay Area. Dissatisfied with American beer, McAuliffe continued brewing as a hobby, eventually saving enough money and finding investors to start a brewery. In October of 1976, McAuliffe founded the New Albion Brewing Company in Sonoma, California, using high quality ingredients to brew small batches of varieties like pale ales, porters and stouts, styles with strong flavors not available from other American brewers of the day.

Another distinction for New Albion was its abandonment of pasteurization for bottle-conditioning as a method of preservation. While pasteurization steamed beer to kill pathogens but ultimately removed some flavor, bottle-conditioned beer made use of yeast leftover from the primary fermentation process to provide a secondary, in-bottle fermentation to carbonate the beverage. Carbonation continues after bottling as the live yeast continues to ferment, in the process using the

remaining oxygen and preserving the beer from spoilage without sacrificing flavor to pasteurization. Though the shelf life of bottle-conditioned beer is marginally shorter than that of pasteurized beer, bottle-conditioning does require more time in production because the beer must fully mature after bottling (Van Munching 1998; Beer Advocate 2012). In 1977, a commitment to quality, not quantity, was a novel idea in American brewing. McAuliffe's focus on fresh and quality ingredients, flavorful recipes, and flavor-adding brewing processes gained New Albion national media attention, and a huge demand for its beer. Though McAuliffe's self-designed brewery could produce 7.5 barrels per week, it simply was not enough to establish an economy of scale given operation costs and New Albion closed in November 1982 (Beer Advocate 2012; Acitelli 2013). The importance of New Albion was not the beer itself, but the brewery's impact on American brewing culture. Within a few years of New Albion's opening, several microbreweries dotted California. Through the 1980s, the growing popularity of Boston's Samuel Adams Brewing Company and Chico, California's Sierra Nevada Brewing Company had brought microbrewing national attention (Acitelli 2013).

Of the several hundred breweries operating in the state during its peak, three small Wisconsin breweries had survived through the many economic uncertainties of the twentieth century: Huber (Monroe), Leinenkugel (Chippewa Falls) and Stevens Point. In 1985, Sprecher Brewing Company opened in Milwaukee, the first new brewery to be established in the state in nearly 20 years, and was quickly followed by others. Seven microbreweries had begun operations by 1990: Sprecher, Hibernia (Eau Claire), Capital (Middleton), James Page (Stevens Point), Lakefront (Milwaukee), Water Street (Milwaukee) and Rowland's Calumet (Chilton). Like New Albion, each of the new breweries focused on implementing unique recipes to brew a variety of styles, brewing seasonal recipes with seasonal produce, using quality local ingredients, and establishing a local economy of scale. Of the seven earliest new microbreweries in Wisconsin, to date only Hibernia has closed its doors (Apps 2005).

During the next decade, craft brewing expanded across the American landscape as hundreds of new brewers started producing beer. Mimicking the larger national trend, the Wisconsin craft brewing scene exploded during the 1990s with the state seeing over 30 new breweries opening for business. The trend only accelerated through the next decade, as 45 more breweries opened, bringing the state's total to 79 operating in 2010. Many of the breweries focused specifically on developing the rich consumer base of Wisconsin beer drinkers by using local ingredients and marketing with local terms: the award-winning Wisconsin Belgian Red from New Glarus notably includes Door County Cherries in its ingredient list, while O'So Brewing Company in Plover, Titletown Brewing Company in Green Bay and Capital's Supper Club lager are named for a common local colloquialisms (Revolinski 2010). A number of these breweries have found great success, despite limited distribution. Perhaps the best example is New Glarus, which was the 17th largest American brewery in 2012 despite not distributing outside of the state of Wisconsin (Brewers Association 2012).

Large-scale breweries were witnessing a much different trend. The big "Beer Wars" of the 1980s and 1990s greatly changed the beer landscape. Some breweries simply declined and were eventually purchased by competitors. All of Heileman's brands were sold to Pabst in 1996, fallout after Heileman owner Alan Bond famously financed his purchase of the company with junk bonds. Pabst stopped producing beer in Milwaukee in 1997 and contracted its beer production to Stroh's facility in La Crosse. After a long decline, Stroh's itself entered receivership in 1999, and its brands were split by Pabst and Miller. Pabst, which by this point had become a glorified holding company with a large portfolio of beer properties, contracted out its brewing to Miller and left the state in 2001. Miller was purchased by South African Breweries in 2002, to form a new company called SABMiller. Several American breweries, to increase competitiveness and market share, with others. Coors merged with Canada's Molson Brewing Company in 2005 to combine operations. Belgian brewing company InBev purchased Anheuser-Busch, America's largest brewer, in 2008. Faced with a newly enlarged competitor in Anheuser-Busch InBev, Molson Coors merged its American production with SABMiller to form MillerCoors later in 2008 (Knoedelseder 2012; Ganey and Hernon 2012; Hintz 2011). In 2012, the largest independently operating brewer in the United States was, in fact, the D.G. Yuengling and Company of Pennsylvania, the fourth largest producer of beer in the U.S. after Anheuser-Busch InBev, MillerCoors and Pabst (Brewers Association 2012).

Though craft brewing has been growing both in business and volume since the mid-1980s, its beer still accounted for just around five percent of the national beer production by 2010. Still, the impact was substantial enough that larger brewers took notice, introducing new styles and brands to squash the fresh competition. Coors, for instance, introduced Blue Moon, a Belgian style beer in 1985 (Van Munching 1998), while Anheuser-Busch launched Shock Top as a direct competitor in 2006. Miller responded to the rise of craft brewing by purchasing Jacob Leinenkugel Brewing Company in Chippewa Falls in 1988 to absorb its recipes and established customer base in the upper Midwest (Apps 2005). Since then, Leinenkugel has become a large regional brewery, expanding in the early 2010s to limited national distribution. Anheuser-Busch InBev also followed this model, purchasing Latrobe, Pennsylvania's nationally distributed Rolling Rock in 2006 (Knoedelseder 2012) and acquiring Chicago-based regional brewery Goose Island in 2011 with intentions for expanding its distribution (Yue 2013). As involvement from the larger brewery companies suggests, craft beer had become lucrative business, with $ 10.2 billion in sales in 2012.

The Brewers Association (2012) found 2,403 craft breweries operating nationwide in 2012, the highest number since the 1880s. The trend is echoed in Wisconsin, where nearly 100 breweries operate in the state, more than any time since prohibition. Brewing remains an important industry to the state of Wisconsin, though now more as an attraction for "beer tourists" who come to sample the state's many craft breweries, as a customer for local agriculture, and to fulfill the continued strong demand for quality beer.

Conclusion

Tightly intertwined into both the history of the United States and Wisconsin, brewing is a tradition that extends to the country's earliest days. The history of brewing in Wisconsin, long one of the largest beer producing states, serves as a microcosm for the larger trends in American brewing. As German settlers moved into Wisconsin beginning in the 1830s, they brought incredible demand for beer, a spoilable product that with technology of the time required production near the point of consumption. As settlers populated the Wisconsin frontier, brewers followed, numbering over 300 in the state during the 1880s. Because of the substantial demand and relatively captive market, brewers were able to establish economies of scale for their products at an exceptionally local level.

These economies of scale were disrupted in the 1870s by new technological innovations in the brewing and preservation process. The implementation of pasteurization, pure yeast cultures and improved bottling techniques allowed brewers to begin distributing to larger markets because the product would not spoil before consumption. Milwaukee's breweries additionally benefitted from the Great Chicago Fire of 1871, which gutted that city's brewing industry. By opening the door for Schlitz, Pabst and Miller to compete in Milwaukee, the Great Fire altered these brewers' economy of scale to a larger market including the city of Chicago, placing them favorably for increased national competition from Anheuser-Busch and others. As breweries began to nationalize distribution in the late-1800s, many Wisconsin beers achieved significant success, with Schlitz and Pabst both spending time as the largest brewers in the country. These constantly growing brewers, which achieved their success thanks partially to improved purity standards, pushed smaller brewers with less reliable quality and smaller margins out of the market. By the time of Prohibition in 1920, Wisconsin was down to just around 110 brewers, a number further lowered by beer production becoming illegal.

After Prohibition, a brief beer bubble popped, leaving in place the trend seeing smaller brewers consolidate or close, while larger brewers continued to jockey for more national sales. By 1983, very few breweries operated in the United States, and the six largest breweries controlled 92% of domestic production. When the craft brewing movement of the 1980s through 2000s took off, Wisconsin saw the establishment of a new network of local breweries that it had missed for much of the later twentieth century. These breweries wielded craft recipes to brew a variety of styles, used quality local ingredients and established local economies of scale, echoing the early local Wisconsin brewers over a century before.

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The World's Beer: The Historical Geography of Brewing in Mexico

6

Susan M. Gauss and Edward Beatty

Abstract

In 1850, beer was scarce in Mexico; most Mexicans instead drank traditional fermented beverages made from a variety of plants, such as maize and maguey. But by 1930, beer had become one of the country's largest modern industries, and by mid-century it was the alcoholic beverage of choice for most Mexicans. Today, Mexico is the world's largest exporter of beer. The geography of beer in Mexico thus has a relatively recent history. Its origins lie in the 1890s, when a number of dominant breweries emerged to command regional markets from their bases in rapidly growing provincial cities. Through the twentieth century, as urbanization accelerated and Mexicans increasingly turned to beer, three of these fought for a national presence. By the 1980s, buy-outs and mergers yielded a duopoly poised to pursue exports aggressively. The historical geography of Mexican beer can thus be mapped globally as well as over a century of shifting regional and national production.

Introduction

For many of us, a quick word association with "Mexico" might likely yield "beer" (or rather, "cerveza"). This is no accident: in 2011, Mexico exported more beer than any other country on earth, and it remains a global leader in beer exports (Morales 2011, 2012). Two giant firms had come to dominate Mexican brewing by the late twentieth century, the Grupo Modelo, S.A.B. de C.V., producer of Corona, Modelo, and Pacífico, and Fomento Económico Mexicano, S.A. (or FEMSA), producer of Tecate, Dos Equis, Sol, and Bohemia. By the mid-1990s, both companies had partnered with multinational brewing giants. Within a decade, Mexico vied with Belgium as the world's leading exporter (López and Barrientos 2005). Yet as recently as 1890, Mexico produced almost no barley-beer of its own, and what little it consumed was largely imported. In comparison to its European and U.S. counterparts then, Mexico's rise to global brewing prominence has been rapid. While the speed of this growth was in many ways a result of Mexico's unique regional demographics, it also paradoxically resulted from its global position as a semiperipheral industrializing economy.

The emergence of the Mexican brewing industry has played out across distinctive spatial, social, and economic geographies. First, the growth of beer consumption and production in Mexico strongly reflected shifting regionally-influenced demographic patterns. In the late nineteenth century, its emergence was strongest in areas with wealthier classes and with a disproportionate presence of central European immigrants—principally in the country's northern states proximate to the US border, as well as in a few large cities. As transportation networks knit the country together and Mexico shifted from a predominantly rural and agrarian country to an increasingly urban and industrial one by the mid-twentieth century, beer consumption spread beyond its regional enclaves. In the process, Mexico's many small and large regional brewers consolidated, leaving three major

S. M. Gauss (✉)
Department of History, University at Albany, State University of New York, 1400 Washington Avenue,
Albany, NY 12222, USA
e-mail: sgauss@albany.edu

E. Beatty
Department of History, University of Notre Dame,
219 O'Shaughnessy
Notre Dame, IN 46556, USA
e-mail: ebeatty@nd.edu

M. Patterson, N. Hoalst-Pullen (eds.), *The Geography of Beer,* DOI 10.1007/978-94-007-7787-3_6,
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brewers to dominate the industry in the second half of the twentieth century.

Second, the rise of beer consumption reflected the rapid social changes that marked the late nineteenth and twentieth centuries in Mexico. From very low per capita consumption in the late 1800s, beer gradually diffused beyond a very small urban elite to the middle class, industrial workers, and many rural residents, reaching a majority of the population by the 1940s. By then, for most Mexicans, beer had replaced pulque—a milky, slightly foamy, and lightly alcoholic drink produced from the fermented sap of the maguey (*agave*) plant—as the low-alcohol beverage of choice. The shifting tastes and habits that accompanied Mexico's evolving social geography created new opportunities for investors during the early twentieth century, fueling new enterprises, marketing campaigns, and eventually corporate mergers.

Third, the geography of beer in Mexico is located in a global landscape. Domestic production grew only through extended efforts to mitigate the challenges of a developing economy, including technological dependency, the pressure of foreign competition, weak markets, and the persistence of traditional habits and customs. Mexico's modern beer industry reflected, in some sense, Alexander Gerschenkron's latecomer phenomenon, where, with state support, it leapt over artisanal forms of production to build large factories from the outset using models, technologies, inputs, and expertise imported from other areas of the world. As the industry grew, its managers developed domestic and local expertise, materials, technologies, and marketing, thereby "mexicanizing" the industry by the mid-twentieth century. By that time, three large, independent firms dominated the national brewing industry and saturated markets across Mexico, destroying the vestiges of regional identification in the industry, building robust domestic markets, and closing out most domestic and foreign competition. As a result, more than many other industries in Mexico, beer has shown significant technological innovation and marketing savvy to become highly competitive on both a national and a global scale. In the process, Mexican beer has become the world's beer.

The Early History of Regional Brewing

Beer first came to Mexico after the Spanish conquest in the sixteenth century. Amid the circular movement of diseases, plants, animals, and people across the Atlantic, new goods and cultural practices traveled to the Americas as well. In 1540, less than twenty years after the fall of the Aztec capital of Tenochtitlán, Alonso de Herrera requested a royal license to produce and sell beer. Within a year he had brought over experienced European brewers, and by 1544 he was selling beer made from local barley and wheat to the Spanish residents of Mexico City (Castro 1983). We know very little about the production and consumption of beer in Mexico over the following three centuries. Though elites consumed some distilled liquors and wine, and perhaps small amounts of locally brewed beer, the vast majority of Mexicans drank pulque and other traditional fermented brews (Busto 1880). At a great distance from the cradle of barley-beer brewing in the Middle East and Europe, and colonized by Spain—a region known for its wine, not beer production—Mexico's long history involved almost no barley-beer production and consumption.

The renewed incorporation of Mexico into the Atlantic world economy in the mid-nineteenth century allowed beer to establish deeper roots in Mexico. Once the monopolistic practices of the Spanish crown were removed with Independence in 1821, Mexico became more open to European emigrants in search of economic opportunities. While local consumption and production of beer slowly gained a foothold, it remained a relatively high-priced luxury item through much of the nineteenth century, consumed by only a few Mexicans and a somewhat larger proportion of expatriates, immigrants, and foreign workers. It was, in the words of one observer, an "aristocratic beverage," supplied by imports from the United States, Germany, and Britain as well as by a few small artisanal breweries founded most often by recent immigrants in the capital and provincial cities. After mid-century, imported brands included Schlitz and Anheuser Busch from the United States, Alsop and Bass from England, and Hofbräu from Germany (Fernández Navarro 2003; Martin 1907; Sutton 1890). Small-scale, artisanal, and few in number, most domestic breweries were operated by immigrants, often of German origin. In the mid-1840s, for instance, the Swiss Bernhard Bolgard operated La Pila Seca in Mexico City, while Federico Herzog, from Bavaria, owned and operated La Candelaria. Both manufactured pale ales from top-fermenting yeast and Mexican, sun-dried barley (Castro 1983; La Cerveza 1964). These immigrants brought the new skills, new tastes, and new capital needed to develop small-scale beer brewing in Mexico. Nevertheless, although there may have been several dozen of these operations spread across Mexico's principal cities, their production was sporadic and beer remained an exceptional and expensive drink in the national palate until the turn of the century.

Therefore, when Mexico's modern beer industry sprang up in the 1890s, it did not do so organically out of a long tradition of barley-beer production or consumption, or even directly from these small workshops.[1] Rather, it emerged due to major transitions in the global economy that coincided with a new era of political peace and economic growth in

[1] The best history of Mexico's early beer industry is Recio 2007, and the best case study is Barrera Pages 1999.

Mexico. After about 1870, Mexico was swept up in the globalizing forces of a booming North Atlantic economy that demanded ever larger amounts of the country's mineral and agricultural resources and flooded Mexico with foreign investment, technologies, and goods. The political regime of General Porfirio Díaz (1876–1910) strengthened Mexico's global exposure for the first time since Independence by enforcing political stability and social peace, sometimes brutally, while promoting economic growth for over three decades. A new national railroad network, largely in place by the late 1880s, broke down Mexico's natural barriers to foreign commerce and dramatically broadened regional and national markets for consumer goods while federal policy provided new incentives for industrial investments. In a classic story of nascent import substituting industrialization, Mexico's government responded to rising consumer demand by raising import tariffs. Protection covered beer and, by the 1890s, also the glass bottles to put it in. As a result, increased import prices provided investors with new incentives to invest in large-scale domestic breweries (Beatty 2001; Barrera Pages 1999). Typically established and financed by Mexicans, these enterprises were built on imported expertise and technology. Like new industries everywhere, Mexico's first industrial brewers faced higher production costs than well-established producers in the United States and Europe. They had to negotiate new markets for nearly all inputs, they had to pay dearly to import know-how and machinery from the United States, and they had to learn slowly how to produce efficiently in a new environment.

Negotiating access to production inputs at decent prices and sufficient quality proved especially difficult for Mexico's first industrial brewers, in part due to the sheer distance from foreign technology and raw materials such as malt and hops, but also because Mexico's own markets were not well-developed or regionally integrated. Farmers had grown barley in Mexico since the early colonial period, though always in very small quantities relative to corn and wheat. As new industrial breweries expanded production through the 1890s, some sought domestic sources of malt, though with mixed results. In 1900, the owners of the Compañía Cervecera de Chihuahua sought an exemption from import tariffs on barley, arguing that they could not produce quality malt without mixing local barley at least fifty-fifty with imported barley. Their request was denied, but four years later, Domingo Barrios Gómez successfully requested the same, plus the tariff-free import of the machinery and parts necessary to erect a malt factory in the town of Cañada, Querétaro.[2] Yet neither effort to establish local malt production succeeded, and Mexican breweries would continue to import their malt from the United States into the 1920s. Access to hops was another challenge, and, due to Mexico's climate and topography, experiments with its domestic production failed. Mexico remains dependent on hops imports to this day. By the early 1900s, brewery owners moved to vertically integrate control over complementary activities. They built glass bottle plants to free themselves from foreign suppliers, and a 1905 partnership between the owners of two of the largest breweries, the Cervecerías Chihuahua and Cuauhtémoc, resulted in the acquisition of the Mexican patent rights to the Owens automatic glass bottle blowing machine, which they installed in Monterrey (Beatty 2009). They also soon established bottle cap, carton, and distribution companies.

Through the first decades of Mexico's late century period of rapid economic growth, imports satisfied Mexico's rising demand for beer and increased by over 500% in the 1880s alone (Sutton 1890). This changed quickly after 1890 with the appearance of the new modern breweries. Although demand continued to outpace domestic production, these new firms gained a growing hold over the national market, and Mexico's beer imports declined by almost 70% between 1890 and 1910, despite rising consumption (Comercio e Industria 1893). Already by 1896, US Consuls had warned the State Department of this new threat to American exports (United States 1901). Between 1890 and 1910, Mexico's consumption of beer rose from just under 5 million L annually to just over 50 million L. Imported beer, which had supplied most of this demand in 1890, fell to less than 5% of total national consumption in the face of rapidly expanding domestic production.[3]

Born in the 1890s, Mexico's modern beer industry was relatively concentrated from the outset, both in terms of scale and location. Half a dozen new brewing firms each raised large sums of capital to import machinery and foreign brewing expertise, erected modern factories in regional cities, explored networks to acquire key raw materials and, of course, developed local and regional markets for their products. Unlike the experience of the brewing industry in the United States and Europe, local producers offered little competition to the new industrial concerns. Rapid industrialization created high barriers to entry, and artisanal brewing could not

[2] Documents on these projects can be found in Mexico's Archivo General de la Nación, Ramo Industrias Nuevas, box 54, folder 3; México, Secretaría de Fomento 1904, Memoria 1901–1904; México, Secretaría de Fomento 1909, Memoria 1908–1909; Diario Oficial de la Nación, March 12, 1904; and El Economista Mexicano, December 10, 1904, January 21, 1905, and May 26, 1906.

[3] Efforts by the authors to quantify annual levels of beer production, importation, and consumption in nineteenth and twentieth century Mexico are ongoing. All statistics used in this chapter represent rough estimates and indicate orders of magnitude and are derived from the following sources, unless otherwise noted: Haber 1989, tables 4.3, 8.2, and 9.4; Serrano 1955, p. 9, 63; El Colegio de México 1960, p. 207, 208; and United States 1880–1911, various issues. See also the census published in México, Secretaría de Fomento, Dirección de Estadística 1900, Anuario estadístico, where we adjusted the annual production of the Compañía Cervecera de Chihuahua from 6.7 to 1.25 million L according to the discussion in Recio 2007.

Fig. 6.1 Beer Production in Mexico circa 1900

compete. Among the six firms that dominated Mexican beer production in 1900, only one predated 1890, and that firm was wholly reorganized in 1900. These six—the Compañía Cervecera de Toluca y México (in Toluca), the Cervecería de Sonora (in Hermosillo), the Cervecería Moctezuma (in Orizaba), the Cervecería Cuauhtémoc (in Monterrey), the Compañía Cervecera de Chihuahua (in Chihuahua), and La Perla (in Guadalajara)—all boasted production capacities of between 1 and 2 million L by the turn of the century (Mexico 1900; Recio 2007). These six firms accounted for the vast bulk of domestic production by 1900, averaging nearly 100 times the capacity of the more numerous small-scale producers (Mexico 1900, 1933; Recio 2007).

The geography of beer in Mexico had a distinct regional logic. Mapping the production of Mexico's breweries at the turn of the century vividly reveals this regional geography (Fig. 6.1). Both consumption and production were concentrated in Mexico's northern tier of states as well as in the more heavily populated center of the country. Three of the six largest modern breweries were established in the northern states of Nuevo León, Chihuahua, and Sonora, while the other three located in the center of the country, in Mexico City, Toluca, and Orizaba. Both regions responded directly to late century population and market growth as well as to immigrant influence and new industrial investment trends. High overland transport costs reinforced this regional concentration, as investors erected new breweries in cities that promised local and regional markets, were near water and other primary materials, and where they would have little competition from other major brewers (Serrano 1955). Outside these regions, consumption and production was low and sometimes nearly absent.

Perhaps the most significant challenge facing Mexico's modern brewers was to expand demand for a product that was largely unknown across wide swaths of the country. Initially, beer consumption was exceptional and concentrated in cities, the north, and among the upper middle class. But Mexico was not an urban country in 1910; in fact, many

Mexicans were rural and impoverished, and, as a country with no widespread tradition of small-scale brewing, beer was absent in many areas. Pulque and other traditional fermented beverages had for millennia been the alcoholic drinks of choice. But it was also a nation on the move due to the profound economic, agrarian, and political changes taking place in the late nineteenth and early twentieth centuries. Most Mexicans were engaged in various forms of agricultural labor by 1910, but due to agricultural modernization and land concentration, new types of socio-economic circuits were bringing many rural villagers into new types of consumer relationships. A growing number of Mexicans found work on the recently-built railroads, in the booming mining districts, in new factories, and in urban employment. They were more likely than their parents to buy ready-made clothing, to eat tortillas on the street instead of in the home, and to drink beer instead of pulque. Mexico's early brewers reacted to this opportunity by embracing new marketing and distribution strategies (Bunker 1997). By 1910, Mexicans consumed over ten times more beer than they had a generation earlier. Changing tastes reflected slowly changing attitudes, and as the editors of one Monterrey newspaper suggested, it was increasingly beer, not pulque, that brought men "comfort and happiness, and open[ed] the way to a higher civilization" (Bunker 1997).

A National Beverage

In 1911, Mexico's longstanding dictator, Porfirio Díaz, was overthrown and forced into exile. Ten years of Revolution succeeded him, with violence and social dislocation endemic in many areas of the country. The impact of this conflict on Mexico's large breweries varied; rebel factions took over some, like the Cervecería Cuauhtémoc, and operated them until their supplies were spent. Others that began the Revolution in decline, such as the Compañía Cervecera de Toluca y México, never fully recovered and were soon bought out by rivals. Mexico's several dozen smaller breweries lost significant ground during the Revolution due to disruptions in markets and inputs, and many closed or were soon bought out in the face of increasingly intense regional and national competition. By the mid 1920s, the country's five largest breweries controlled 77% of national production and the total number of remaining producers had fallen from about five dozen or so in 1900 to about two dozen (Mexico 1900, 1933; Recio 2007).[4] By 1930, three firms dominated the industry: the Cervecería Cuauhtémoc, the Cervecería Moctezuma, and the Cervecería Modelo, the last founded in 1922 by Spanish investors and currently Mexico's largest brewer.

The 1920s provided new opportunities, bode well for the beer industry in Mexico. With a return to political peace, governments enacted new laws promoting and protecting investment in domestic industry, and the private sector responded with the creation of new corporations, industries, and development banks. As a result, Mexico's urban working class expanded rapidly, creating new markets for consumer goods, especially for non-durables such as beer. After 1919, prohibition in the United States further supported the Mexican beer industry, both by limiting foreign competition and by spurring tourism to the Mexican side of the border. It even spawned the creation of the Cervecería de Mexicali, one of Mexico's most enduring regional brewers, established in 1923 on the U.S. border (Gastélum Gámez 1991). Beginning in the 1920s, Mexico's largest brewers moved to consolidate their hold over the industry. Over the next decades the geography of Mexican beer would shift decisively: its initial regional geography of production became distinctly national; its social geography of consumption spread far beyond the urban elites of the previous century; and the country's largest breweries internalized the technical expertise of industrial beer making and marketing.

While the market was already dominated by just three firms by 1930, each was still producing largely for regional markets. Through the middle decades of the twentieth century, these firms moved to establish a national presence. They accomplished this in part due to state support for the industry, but also due to new types of business arrangements, including strategic buy-outs and sub-contracting that allowed the three big brewers to nationalize their production and distribution. Critically, government policy typically favored beer over other types of alcoholic beverages, including pulque and distilled liquors, through much of the twentieth century. Not only was beer taxed at a lower rate than other alcoholic beverages with a similar alcohol content (like pulque), it was also regulated distinctly. Through mid-century, beer was often exempted from local prohibitions and sanitary regulations that targeted pulque, which was seen as traditional and backward (La Cerveza 1964). Even amid a blossoming temperance movement, in a meeting with representatives from 24 breweries in September 1930, pro-temperance President Pascual Ortiz Rubio expressed great sympathy for the industry (Grupo Modelo 2000). Industry owners fostered the distinction between pulque and beer by promoting beer as a healthy and nutritious "soft drink," despite scientific evidence supporting pulque's importance in the diet of some Mexicans (Anderson et al. 1946).

More important than state support in nationalizing production and distribution, however, were new types of business practices that emerged during the mid-twentieth century. Brewers' strategies for growth became increasingly

[4] By the 1920s, the Cervecerías Chihuahua and La Perla were no longer among the largest firms, though the list now included the Cervecería Modelo.

sophisticated. Building on efforts begun soon after 1900 but interrupted by the Revolution, each began to establish sales agencies and warehouses in distant markets dominated by competitors (Barrera Pages 1999; Haber 1989). Moreover, buy-outs became commonplace in the industry. The Cervecería Cuauhtémoc unsuccessfully attempted to buy its main rivals, the Cervecería Modelo in the late 1920s and the Cervecería Moctezuma in the mid-1930s (Recio 2004). It succeeded in purchasing the Cervecería Central in Mexico City in 1928, allowing it to manufacture that brewer's most well-known brands and compete directly with the Cervecería Modelo in Mexico City, without the added burden of transport costs. In turn, the Cervecería Modelo for a time shipped its product to Monterrey and purposefully undercut the Cervecería Cuauhtémoc's prices in an effort to capture markets there, though collusion and price fixing in regional markets soon became more common in the industry (Recio 2004; Grupo Modelo 2000). The Cervecería Modelo also completed a buy-out of the Compañía Cervecera de Toluca y México in 1935, which had never recovered from the downturn of the Revolution due to administrative mismanagement (Barrera Pages 1999). In doing so, Modelo took over production of Victoria beer, the oldest nationally-distributed beer in Mexico.

Sub-contracting also became commonplace in the industry in an effort to expand into competitor's markets. For example, the Cervecería Cuauhtémoc in Monterrey began to contract with smaller regional breweries throughout the country to manufacture its products. This included the Cervecería de Nogales, in Veracruz, which allowed the Cervecería Cuauhtémoc to compete with the Cervecería Moctezuma in that region. Soon after, in 1935, it contracted the Cervecería Occidental, in Guadalajara, to produce some of its cheaper labels (Monterrey, Indio, Quijote). As a result, by the end of the 1930s the Cervecería Cuauhtémoc produced its brands in Monterrey, Mexico City, Veracruz, and Guadalajara, thereby establishing a presence in each of Mexico's largest urban areas at that time. In 1954, the Cervecería Modelo bought both the Cervecería Estrella (in Guadalajara) and the Cervecería Pacífico (in Mazatlán). In that same year, the Cervecería Cuauhtémoc acquired the troubled Compañía Cervecera de Tecate, originally formed in 1944 to quench higher wartime demand, but bankrupt by 1947 (Price 1973). In short, through acquisitions and sub-contracting, each of the three big brewers was able to build a truly national presence by the mid-twentieth century, and both production and consumption of beer from any of these firms no longer obeyed a regional logic. This spatial shift was cemented when each began to build entirely new production facilities in the 1960s. The Cervecería Modelo built two new plants in the north one (in Sonora in 1961 and in Torreón in 1967), as well as one in Guadalajara in 1964. In 1965, the Cervecería Cuauhtémoc built its first new factory since the 1890s, in Toluca, just outside Mexico City (Ortega Ridaura 2006).

The concentration of the industry continued into the 1970s, when the Cervecería Cuauhtémoc finally acquired the regionally-dominant northwestern brewer, the Cervecería de Mexicali. The Grupo Modelo's acquisition of the southeastern Cervecería Yucateca in 1980 represented the penultimate step in the national consolidation of the industry. Since about 1950, the big three brewers—the Cervecería Cuauhtémoc, the Cervecería Moctezuma, and the Cervecería Modelo—together have controlled about 85% of the domestic market (Alonso 2011). Then, in 1985, the Cervecería Cuauhtémoc merged with the Cervecería Moctezuma, creating the brewing duopoly that has characterized the industry into the early twenty-first century.

At the same time that Mexico's largest breweries pushed into national markets, beer consumption spread rapidly across the country's social landscape. By the middle of the twentieth century, Mexicans drank more beer than any other alcoholic beverage, including pulque. National beer production grew from about 52 million L in 1924 to about 72 million in 1930. The industry rebounded from the Great Depression and output quadrupled between 1932 and 1940, before reaching about 575 million L in 1953. Imported beer, meanwhile, barely registered in the national accounts. Remarkably, this growth took place despite huge obstacles in the 1920s and 1930s, including weak domestic markets for consumer goods and a strong temperance movement supported by multiple presidents.

Between the 1930s and 1950s, Mexico became a nation of beer drinkers, although consumption continued to be shaped by regional demographic distinctions. Sales per capita were highest in urban areas, along the northern border, and in areas with significant migration and foreign presence. Of the eight states with the highest consumption, all were either along the U.S. border (Baja California, Sonora, Nuevo León, Tamaulipas), along the Caribbean coast (Quintana Roo, Yucatán, Veracruz), or were heavily urban (Mexico City). In these states, consumption averaged over 30 L per capita annually at mid-century, while the national average was closer to 26 L (La Cerveza 1964).

The geographic pattern of beer consumption reflected both entrenched demographic trends as well a variety of transitions that had begun in the late nineteenth century but which intensified by the mid-twentieth. As in the late nineteenth century, along the northern border beer consumption remained higher than in other areas because migratory patterns had long brought immigrants to the region; because imported beer faced lower transport costs from the United States; because the region was an important early center of modernizing Mexican industry; and because U.S. consumers took advantage of their proximity to Mexico to imbibe south of the border. Further, while low-alcohol, traditional,

fermented beverages like pulque had a strong history in central and southern Mexico, there existed no low-alcohol fermented beverage in the north to compete with beer since the northern climate did not permit easy maguey cultivation.

Beer consumption in urban areas also was higher than the national average, and rapid demographic growth in Mexico's major cities through the mid-twentieth century was a primary factor driving the growth in beer markets. Mexico City alone expanded from just over 1 million people in 1930 to over 20 million people today, offering a massive market by the mid-century, and sales there far outstripped those of other regional markets (Mexico 1994; La Cerveza 1964). Other cities, like Monterrey and Guadalajara, experienced similar growth rates, providing industrial breweries with multiple urban markets. Relatively high levels of beer consumption in urban areas mapped both spatial and social geographies. Spatially concentrated markets and developed urban infrastructure eased distribution and marketing. At the same time, the rapid growth of middle and working classes with disposable income and changing consumption tastes constituted major new markets for brewers. By 1965, Mexico City consumed about 20% of the nation's beer, followed by Veracruz at about 11% and by the Estado de México at roughly 5%. Fully one-third of the country's beer was consumed in a geographically narrow area in the center of the country (La Cerveza 1964).

Perhaps the biggest shift in consumption after mid-century was the dramatic growth in rates of consumption in rural areas, which by the 1960s were close to matching the consumption rates of urban areas (La Cerveza 1964). Access to disposable income, shifts in rural land ownership patterns that hurt pulque production, and rural-to-urban migration all help to account for the ruralization of beer markets. The development of a national transportation network was also key. Regional brewing monopolies had in the 1890s reflected the high costs of shipping this highly perishable product in a country with a relatively weak railway network (Haber 1989). Around 1900, companies were already investing in rail lines to connect their facilities with the national system, but efforts to establish national distribution took off from the 1920s to 1940s. Companies invested heavily in refrigerated rail cars, a technology that undermined the basis for regional monopolies, and worked to negotiate better freight rates with the national rail lines. Nevertheless, in the 1920s, it was still almost fifty percent more expensive to ship beer from Monterrey to the Caribbean port of Tampico (a distance of about 320 km), than from Liverpool (Recio 2004). Beginning in the 1930s, however, federal investment in highways and local road commissions brought cheaper transport to areas of Mexico that had been isolated formerly, and the largest brewers soon acquired their own trucking fleets. They also contracted with others to handle shipping, as the Cervecería Cuauhtémoc did with Mercedes Benz in the 1930s (Ortega Ridaura 2006). By 1970, Mexico had constructed close to 71,000 km of federal highways, providing brewers with the infrastructure for reaching rural populations (Fulwider 2009; Grupo Modelo 2000).

Mexican brewers had always understood that developing new beer consumers was critical to nationalizing sales. To do so, they tapped into the emerging ethos of mass consumption. Breweries invested heavily in commercial advertising as early as the 1890s, typically associating their brands, and beer generally, with a modern, progressive future. While sometimes taking their names from Mexico's indigenous past—like Moctezuma II and Cuauhtémoc (two of the last Aztec emperors)—they all quickly adopted modern mass marketing strategies. They advertised heavily in Mexico's daily newspapers, sometimes comparing their product to foreign models (the Cervecería Cuauhtémoc touted "The Beer that Made Milwaukee Jealous!"), and sometimes to domestic greatness (the Cervecería de Sonora claimed "The Best Beer in the Mexican Republic!"). They also sent their leading brands to international expositions, set up marketing tents in public plazas, and established sales offices throughout the country.

The Cervecería Modelo, for instance, bought not just print ads, but also sponsored festivals and paid for automotive advertising and murals to promote their products (Grupo Modelo 2000; Snodgrass 2003). The 1940s brought new opportunities to advertise in radio, TV, print, and film. Recognizing the limits to brand recognition outside the major metropolitan areas, the Cervecería Modelo created the Caravana de Estrellas Corona, which from 1956 to 1982 traversed the nation as a mobile artistic revue of no less than 50 artists and performers. It aimed to bring entertainment to Mexico's interior at popular prices while promoting Modelo brands. Over the years, it hired hundreds of artists and performers, including internationally-famous singers such as Celia Cruz, Pedro Infante, and Julio Iglesias (La Caravana Corona 1995). Beer advertising and sponsorships today have become near ubiquitous, with Corona banners or Tecate ads blanketing everything from *fūtbol* (soccer) and bullfights to concerts in Mexico and now even golf and NASCAR events abroad.

Finally, the shifting geography of beer in twentieth century Mexico also took place within firms as they replaced foreign expertise with local technical and entrepreneurial capabilities. Initially dependent on foreign brewmasters, technicians, and supplies, all the larger breweries had begun to develop internal capabilities by the early twentieth century (Womack 2012; Beatty 2009). The Cervecería Cuauhtémoc stood out in the early years for its aggressive vertical integration. From the 1890s through the 1950s, the company built or acquired a cork factory, an automated glass bottle plant, a cardboard box factory, a bottle cap factory, a malt plant, and a firm to print labels (Ortega Ridaura 2006; Hibino 1992). Other major brewers, including the Cervecería

Modelo and the Cervecería Moctezuma, soon followed suit, establishing or acquiring the facilities needed to produce and distribute their product while lessening their dependence on imported supplies.

From the 1920s through mid-century, each of these firms "mexicanized" production by developing internal technical expertise and by diversifying and integrating their investments into ancillary processes. The well-known Garza Sada group in Monterrey, owners of the Cervecería Cuauhtémoc, commonly sent their children and the firm's technicians to study abroad; in 1943, they formed the Instituto Tecnológico y de Estudios Superiores de Monterrey—the prestigious Tec de Monterrey—to educate new generations at home. As a result, by mid-century both the Cervecería Cuauhtémoc and the Cervecería Modelo were introducing their own new technologies and machinery, developing a competitive advantage in brewing processes that would later allow them to compete successfully abroad. For example, the Cuauhtémoc group developed the first fully automated blow press bottle maker, selling the machinery to glass bottle plants in the United States, Germany, and Australia in the 1960s. Other new machines soon followed (Hibino 1992).

From their early days around the turn of the twentieth century, Mexico's major brewers had relied on foreign brewmasters, bringing them to Mexico from the U.S. and Germany to help produce high quality beers. Through contacts at Anheuser Busch, for example, the Cervecería Modelo enticed master brewer Adolf Schmedtje to come to Mexico in the 1920s. He stayed for five years, and was responsible for the first recipes of Modelo and Corona. He left for new opportunities in 1928, but was immediately replaced by another German, Wolfgang Probst. Breweries also brought in foreign technicians to help establish malt production facilities and other activities (Herrero 2002; Grupo Modelo 2000). These and many other foreign-born master brewers and technicians played a prominent role in Mexican brewing well into the mid-century. But by the 1960s, owners sought to standardize, institutionalize, and internalize production processes. The Grupo Modelo, for example, hired a wave of Mexican-trained engineers and technicians to introduce consistency and quality control norms in all departments. In the eyes of Antonio Fernández, an owner of the Cervecería Modelo, the era of the scientific production of beer, of engineers, and of rationality had begun. Soon, these young Mexican technicians supplanted the traditional master brewers (Grupo Modelo 2000). Internal research and development continued to grow in the 1970s, especially as the domestic market expanded and consolidated.

By the time the Cervecería Cuauhtémoc merged with the Cervecería Moctezuma in 1985, creating Mexico's brewing duopoly, large-scale brewing had transformed radically from its origins a century earlier. This transformation played out over spatial as well as temporal geographies. Local and regional markets had largely disappeared as new production and distribution networks nationalized the economy, and Mexico's mostly rural, and agricultural population was, in 1985, largely urban and wage earning. Mexico's disparate, distant provincial cities were now part of a well-integrated nation. Dependence on foreign capital and technology had been diminished, at least for the beer industry, with the internalization of financing, business strategy, and expertise. And what was once a drink of a small elite located in discrete provincial cities was now a national beverage, preferred by most, including tourists eager to take a bit of Mexico home with them.

Conclusions

The story of Mexican beer appears in many ways similar to other national beer histories. Expanding markets and industry consolidation have transformed the national geographies of brewing across the globe. Mexico's brewing history also mirrors the iconic tales of industrialization in developing countries, where high levels of capital concentration, political connections, and cheap labor have spurred dramatic but uneven growth across the late nineteenth and twentieth centuries. Yet the Mexican brewing industry defies expected outcomes. When the global economy opened in the 1980s under the banner of neoliberalism, and Mexico's protectionist wall came tumbling down with the passage of NAFTA, the Mexican brewing industry did not fall victim to an influx of first world imports, as happened with other Mexican industries. Even more, the reasons for its subsequent rapid growth were not related to the political machinations that gave some companies and individuals a dramatic competitive advantage. The telecommunications industry, where Carlos Slim Helú became the world's richest man, is a case in point. Rather, the Mexican brewing industry had already undergone significant modernization over prior decades, and when obstacles to trade diminished, its owners quickly moved into global markets.

Prior to the 1980s, Mexico's beer exports had been insignificant. But in 1979, Corona became the first brand exported to the United States in larger quantities. Even Modelo executives were taken by surprise by the rapid jump in foreign demand as returning vacationers sought to experience a bit of Mexico north of the border. Between 1984 and 1986, Corona exports went from 1.6 to 12 million cases annually. Soon after, global investment, beginning with Labatt Canada's purchase of a 22% stake in the Cervecería Cuauhtémoc-Moctezuma, began to pour into the industry (Pilcher 2010). Since then, ties to global conglomerates have expanded along with exports. By the early twenty-first century, the Grupo Modelo had partnered with Anheuser-Busch InBev, while the Cervecería Cuauhtémoc-Moctezuma (FEMSA) became linked to Heineken. The logic of this sort of global

consolidation is now coming under fire amid global concerns over monopolies. These transnational consolidations, however, meant that by 2011 Mexico had become the world's leading beer exporter.

Thus Mexico's beer became the world's beer at the end of the twentieth century. This dramatic transformation was built on a century's history of domestic growth. In 1850, beer was nearly invisible in Mexico. By the 1890s, local and foreign investors began to build a modern brewing industry as increasing numbers of urban, working class Mexicans turned toward beer drinking. The most successful of these breweries, initially established to supply regional markets, had become by the 1930s one of the most dynamic sectors of the Mexican economy. By mid-century, beer had become the national beverage, and Mexico's largest breweries were poised to ride a long sudsy wave that would by century's end wash over the shores of countries worldwide.

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Geographic Appellations of Beer

7

Roger Mittag

Abstract

Appellations of beer are not founded in growing regions but rather in brewery locations. Development of global beer culture and modern beer styles are rooted in specific, historical brewing centers around the world. According to the Periodic Table of Beer Styles II, there are 65 existing beer styles. This continues to change as brewers are constantly creating new hybrids styles and in 2013, The BJCP (Beer Judge Certification Program) recognized 80 individual styles. In the world of beer, there are very few appellations that restrict the use of style names to a geographic areas—such as the styles of Lambic (a spontaneously fermented beer that originates from an area just southwest of Brussels) and Kölsch (a blonde, lightly hopped ale brewed only by the brewers of Cologne [Köln]). Other styles such as Trappist, while originating in medieval Normandy, France are now primarily located in the Western European countries where beer took its monastic traditions. This chapter introduces historical and geographical importance of styles such as Pilsners, Porters, Stouts, Pale Ales, India Pale Ales, Cream Ales, and Steam Beers.

Introduction

Appellations of beer are not founded in growing regions but rather in brewery locations. Development of global beer culture and modern beer styles are rooted in specific, historical brewing centers around the world. According to the Periodic Table of Beer Styles II, there are 65 existing beer styles. This continues to change as brewers are constantly creating new hybrids styles and in 2013, The BJCP (Beer Judge Certification Program) recognized 80 individual styles. In the world of beer, there are very few appellations that restrict the use of style names to a geographic areas—such as the styles of Lambic (a spontaneously fermented beer that originates from an area just southwest of Brussels) and Kölsch (a blonde, lightly hopped ale brewed only by the brewers of Cologne [Köln]). Other styles such as Trappist, while originating in medieval Normandy, France are now primarily located in the Western European countries where beer took its monastic traditions. This chapter introduces historical and geographical importance of styles such as Pilsners, Porters, Stouts, Pale Ales, India Pale Ales, Cream Ales, and Steam Beers.

All of these beers styles fall under two larger families of beers; Ales and Lagers. The word ‘ale’ is believed to be derived from the Anglo-Saxon word ‘Ealu’.[1] This more traditional form of brewing relies on top-fermenting yeasts under warmer brewing temperatures that result in fruitier aromatics and fuller body. Lagers (a German word meaning ‘to store’) were first mentioned in 1420. Yeasts that reacted with colder temperatures were required to be aged for longer periods of time[2] to allow volatiles such as diacetyl and sulfur to dissipate. These beers are viewed to be bottom fermenting and require longer fermentation and aging times than ales.

It is important to note that the styles discussed here are the basis for much change in the brewing industry. Modern brewers are becoming increasingly creative and

R. Mittag (✉)
School of Hospitality, Recreation & Tourism, Humber College Institute of Technology and Advanced Learning,
205 Humber College Boulevard (North Campus),
M9W 5L7, Toronto, ON, Canada
e-mail: rmittag@thirstforknowledge.ca

[1] Rabin and Forget (1998, Dictionary, p. 12).

[2] Ibid., (p. 165).

M. Patterson, N. Hoalst-Pullen (eds.), *The Geography of Beer*, DOI 10.1007/978-94-007-7787-3_7,
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are developing new hybrid beer styles that are constantly changing the landscape of beer.

European Beers

The majority of traditional styles of beer are founded in European brewing traditions (Fig. 7.1 and 7.2). The harsher, drier climates were favorable to the growing of grains such as barley, wheat, oats, and rye. In addition, the area around the 49th parallel is the prime growing region for hops which require mild winters, warm summers and sandy soils.[3] Water quality and composition have also played an important role in the development of many different beer styles. Ingredients such as grains and hops could easily be transported to the brewery but the large volume of water required forced the brewer to establish the brewing operation near a good quality source of water. The type of minerals found in ground water is now a crucial component to adhering to beer style development. For example, pale ales that originated in the calcium and magnesium rich water of Burton-on-Trent use hard water while pilsners from Bohemia rely on soft, mineral free water.[4] This section will examine beer styles starting in the southern regions of Europe and culminating in the north.

Bohemian Pilsners

Pilsners were not the first lagers but were the first golden, clear beers in the world and can be credited with the increased use of glassware. Prior to 1842, beer was dark and cloudy (unfiltered). Bavarian brewers such as Gabriel Sedlmayr of the Spaten Brewery and Viennese brewer, Anton Dreher were pioneers in developing lagering brewing methods that included the use of pale malts (brought back from a trip to England and Belgium) and also refrigeration (developed by Carl von Linde).[5] Lager brewing was introduced in the 1840s and became a crucial linchpin in the development of the Pilsner style.

The brewing community in Plzeň, Bohemia (part of the Austro-Hungarian Empire) may have had the largest impact of all time on the beer industry. In 1842, unhappy with the quality of their beers and the increasing competition of Bavarian dark lagers, the collective owners of the brewpubs of Plzeň enlisted the help of Josef Groll[6] (a former student of Sedlmayr and Dreher). The first pilsner was brewed in the Bürger Brauerei which is also known as Pilsner Urquell or in Czech, as Plzeňskŷ Prazdroj. People became fascinated with

Fig. 7.1 Map of Burton on Trent, England and surrounding countries of the United Kingdom

Fig. 7.2 Regional map of Payottenland, Belgium (Senne Valley) and Koln, Germany, located in central Europe

the new brilliant, golden beer with the bright, frothy head and demand increased right across Europe. Ingredients played a significant role in the development of the Pilsner standard and included the sweet, delicate nature of Moravian malts, the spicy aromatics and low bitterness of Saaz hops and the rounded finish brought on by the mineral free water of Plzeň. Finally, one of the keys to a great pilsner is the long (21 days) maturation in the caves and stone cellars under the city.

Many of the world's bestselling beers can trace their brewing roots back to pilsners. New world brewers in

[3] Mittag (2013, Prud'homme, p. 7).

[4] Oliver (2012, Oxford, p. 285).

[5] Ibid., (p. 724).

[6] Jackson (1997, Beer, pp. 211–212).

the 1800s took the brewing heritage from their homelands and altered the recipes to meet the demands of their thirsty consumers thus leading to the invention of the North American lager.

World class pilsners have many distinctive characteristics such as brilliant, deep golden hues. Their aromatics are also quite robust with substantial hop aromas like grassiness and spice from the noble European hops such as Hallertau and Saaz and a good portion of bread crust and biscuit from the 2-row Pilsner malts. The body of the beer should be fuller with an IBU[7] (International Bittering Units) count of between 25 and 38.

In 2005, according to Roger Protz, the European Union granted Protected Geographical Indication (PGI) to Budweiser Budvar which is the equivalent of an appellation.

Pilsner Styles

Style	IBU	Colour	Malt Characteristics	Hop Characteristics	Body/Other
Bohemian Pilsner	25–38	Golden to light amber	Good portion of malt with definite caramel overtones	Medium to high bitterness with generous hop aroma and flavours	Medium to full body with some lingering sweetness/bitterness
German Pilsner	19–28	Straw to golden	Medium malt flavours (more on the biscuit side)	Generous hop bitterness with notable grassy aromas and flavours	Light to medium body with a very dry finish
North American Pilsner/Lager	12–21	Straw to light amber	Low to medium malt tending toward cereal and white bread	Low to medium hop notes, generally used for bittering	Extremely light body with crisp finish, somewhat sweet

Kölsch

Germany is renowned as a country of bottom fermented beers; lagers. The two variations of top fermented beers historically rooted in the Rhineland are Altibers and Kölsch. Altbiers, originally from Dusseldorf, are copper colored, cool fermented with a very dry finish[8]. Kölsch are golden colored and are a direct result of introduction of pilsners into the area. The city of Cologne (Köln), located in the Rhineland province of Germany, is the home of one the true appellations in the brewing industry. In 1396, the oldest trade organization in Cologne was formed and aptly, the Guild of Brewers (Kölner Brauer-Kooperation) has had a unique effect on the brewing of beer in this region by enforcing brewing standards that are still in effect today.

During the 1800s, the trend toward bottom fermenting golden lagers (pilsners) was spreading beyond Bohemia and Bavaria and into Köln. In many cases, the best way to deter outside influences it to fight fire with fire and so, the brewers of Köln decided to create a golden coloured beer of their own.[9] This new beer continued to be made with pale malts, local hops and with ale yeasts (top fermenting). This was one of the first hybrid styles of beer that combined the techniques of lagering (cool fermentation and longer aging). The goal was that all Pilsners were refused entry at the gates of the city.

In 1986, a convention was created to define a 'Kölsch' which describes this beer as "a light-colored, highly fermented, strongly hopped, bright, top-fermented Vollbier".[10] In 1996, The European Union in addition to Germany has recognized Kölsch with a PGI (see above). It is important to note that brewers who do not belong to the Guild or are outside the geographical boundaries of the convention must call their beer Kölsch-style or Lagered Ale. Moreover, the glass used to drink this beer had restrictions. The shape of the glass is to be straight sided and should bear no unnecessary decorations and is .2 liter in volume and is referred to as a 'Stangen.[11]' This small size of the glass is to ensure that drinkers will constantly receive a fresh beer. It is common practice in Cologne beer halls to place a beer mat or coaster on top of the glass if you do not wish to continue drinking.

This style has a significant hop nose (mainly grassy from German hops) with a hint of fruit but is extremely thirst quenching and can be compared to Cream Ales and California Common beers.

Lambic

The region known as Pajottenland, Belgium is the home to Lambic beers. This geographical area that surrounds Brussels in a 15 km^2 radius and encompasses the Senne River Valley is unique and is protected by royal decree. On the 20th of May, 1965, a law was passed to define and protect beers that were spontaneously fermented and known as Lambic, Gueuze Lambic and Gueuze.[12] Spontaneous fermentations do not use pure yeast strains. Instead, the wort[13] is cooled and transported to large, open fermenting vessels known as

[7] International Bittering Units (IBUs) is a scale designed to measure the amount of hop resin remaining in wort.

[8] www.germanbeerinstitute.com/altbier.html.

[9] Oliver (2012, Oxford, p. 519).

[10] Oliver (2012, Oxford, p. 519).

[11] Ibid, (p. 519).

[12] Bastiensen (2000, Interbrew, p. 42).

[13] Wort is the filtered, sugar rich liquid that is produced by combining hot water and ground malt.

'cool ships'. Windows are opened to allow the natural yeasts to begin fermentation. These wild yeasts are known as *Brettanomyces* and only found in the Senne Valley and are the truly unique ingredient that creates the various and complex flavors found in Lambic beers. Two of these yeast strains are known as *Brettanomyces bruxellensis* and *Brettanomyces lambicus*. In addition, bacteria that lives inside the wooden oak barrels used for aging are also a source of flavor and aroma.

The original mention of Lambic, as a style of brewing, dates back to 1559 and is believed to be a reference to the village of Lambeek, (approximately 20 km southwest of Brussels) or for the French word for still (alambic). Taxes were much lower than in surrounding areas and therefore brewers and distillers were encouraged to locate to this area.

In accordance with Belgian law, a Lambic beer must use a minimum of 30% malted wheat. All Lambics are aged in wooden barrels for a minimum of 6 months and up to 6 years (many of them are used port barrels that can reach a capacity of 11,220 L of beer).

Lambic beers are generally acidic in nature and come in a variety of different styles such as Lambic, Gueuze, Bière de Mars, Faro and Fruit. Each style relies on the expertise of the blender. The apprenticeship requires 3 years to develop the nose to create unique and consistent beers.

Lambics are dry, complex, quite acidic and without carbonation. Young Lambics are often honey colored and boldly acidic (tart and lively) while mature Lambics are mellower with greater depth with fruity characters.

Gueuze is a blend between young and mature Lambics whose characteristics include lively champagne like carbonation. Each cask is different and the blender will attempt to bring out the best of each. The blend could be as much as 70% young Lambic or as little as 15%.

Bière de Mars was very popular in the early 1900's and was typically a low alcohol Lambic beer that was made from using malts a second or third time. These beers were typically brewed in March and were intended to be a more thirst quenching beer for the summer months.[14]

Faro is a Lambic that has been blended with Bière de Mars (spring beer) and then sweetened with candy sugar or caramel. The origin of the word remains very vague. It is believed that "faro" comes from the Portuguese "faro" wines. Others say that it comes from the French word "faraud", which means to brag or boast.[15]

Fruit Lambics include Kriek (Flemish word for cherry) and Framboise (French word for raspberry). These slightly sweetened, yet refreshingly tart beers are far more approachable. According to Brewmaster, Bill White, there are stories about the origins of Fruit Lambics that surround the mischievous addition of fruit to a neighbour's beer. The names of the beers reflect both the influences in Belgian culture of the French and the Dutch.

Many brewers are fascinated with the characteristics brought on by using wild yeasts and are adopting spontaneous fermentation techniques without the ability to use the appellation, 'Lambic'.

Trappist

The Trappist appellation is one of the most recent in the world of brewing despite being one of the oldest and geographically relevant methods of brewing. It is important to note that Trappist brewing does not center around one style. Instead, it can be viewed to be a category. Monastic brewing has been done by various religious orders since the middle Ages. St. Benedict (480–547 AD) is credited with starting the modern monastic existence. Having been inspired by Jesus' time in the wilderness, St. Benedict insisted that monks support themselves. As the movement spread from Rome north into the Alps, beer and barley replaced grapes.[16] The Roman Catholic Church has always seen alcohol as an acceptable gateway to spirituality. During Lent, it was allowable for the monks to consume beer and wine while fasting.

The Trappist order dates back to the Cistercian monastery of La Trappe, France. The Trappists, like many other religious orders, originally brewed beer for a variety of different reasons. They brewed to support their own community, in a spirit of self-sufficiency, while also providing beer to pilgrims and travelers. In addition, as a non-secular society, there were many items that could not be obtained from within the monastery or abbey walls and therefore they used beer for trade with the public. Nowadays, in modern times, Trappist breweries also brew beer to support local communities in addition to running the brewing operation of a monastery.[17]

Today, there are only eight Trappist breweries which remain active in the Trappist appellation but there is several more applying for acceptance. The six authentic Trappist breweries in Belgium include Achel, Chimay (the largest), Orval (the oldest), Rochefort, Westmalle and Westvleteren. There is only one in the Netherlands (La Trappe), and one in Austria (Engelszell). In 1997, eight Trappist abbeys including the created the International Trappist Association (ITA) to stop non-Trappist commercial breweries from using the Trappist name. This private association created a logo that is given to any items such as cheese, beer, wine, etc. that respect the exact production criteria. For the beers, these standards are as follows:

[14] Oliver (2012, Oxford, p. 128).

[15] Bastiensen (2000, Interbrew, p. 43).

[16] Jackson (1997, Beer, pp. 131–132).

[17] Ibid., (pp. 131–132).

The beer must be brewed within the walls of a Trappist monastery, either by the monks themselves or under their supervision.

The brewery must be of secondary importance within the monastery and it should witness to the business practices proper to a monastic way of life

The brewery is not intended to be a profit-making venture. The income covers the living expenses of the monks and the maintenance of the buildings and grounds. Whatever remains is donated to charity for social work and to help persons in need.

Trappist breweries are constantly monitored to assure the irreproachable quality of their beers.[18]

Many regard all Trappist beers to be 'Abbey' beers, but the designation of Abbey is for those beers that are currently being brewed in commercial breweries, monasteries other than Trappist or simply have monastic traditions.[19]

While it is difficult to categorize Trappist beers, most of the beer produced in the monastic traditions can be segmented into four specific areas. The names Single (Blonde), Dubbel, Tripel and Quadrupel are generally used to denote the amount of malt and sugar used to create higher levels of alcohol.[20] Interestingly enough, Singles and Tripels are generally blonde in color while Dubbels and Quadrupels are brownish-red. Belgian yeast strains are very complex and quite often contribute aromas of spice (cloves) and fruit (apple or pear) and oddly enough, bubble-gum. These aromatics are most often found in Blonde ales. Brown ales such as Dubbels and Quadrupels are known for the malty characteristics such as darker breads, dark fruit and the sweetness associated with sugar.

Style	IBU	Colour	Malt Characteristics	Hop Characteristics	Body/Other
Single/ Blonde	15–21	Golden to light amber	Good portion of malt with definite crusty bread notes	Little to none	Spice notes, bubble-gum, and fruity aromatics such as banana/ apple
Dubbel	15–21	Copper to brownish red, cloudy	Malt accents with nutty, toasted and chocolate flavors	Little to none	Light to medium body darker fruit notes like plum, prunes, figs and dates
Tripel	15–21	Golden to light amber, cloudy	Somewhat sweet with very little toasted or nutty flavors, and mainly fruity notes	Little to none	Spice notes, bubble-gum, and fruity aromatics such as banana/ apple
Quadrupel	15–21	Copper to brownish, red, cloudy	Sweet, honey, brown sugar, dark fruit flavors and hints of chocolate	Little to none	Body is full and cloying, higher alcohol notes are hidden

Porters and Stouts

England, along with Bavaria and Bohemia has always been one of the great brewing centers of the world. The industrial revolution in England during the 1700's revolutionized beer production. Almost overnight with the advent of steam power and mass production, British brewers became world powers.

There is much debate about the origin of Porters and Stouts. The most popular belief is that many brewers were blending beer into a concoction known as 'three threads' which consisted of equal parts of ale, beer and twopenny (a strong beer which cost a tuppence a quart). This process of blending beers allowed the publican to be able to quickly meet the needs of the customer.

A brewer named Ralph Harwood of Shoreditch, London attempted to re-create the flavours in the three threads and by using roasted malts developed a beer that was known as 'Entire'. This dark, robust beer became a favorite of the men who worked in the shipyards and local markets and was aptly named after them and thus the 'Porter' was born. Porters became the first mass produced beer of the industrial revolution.[21]

Eventually, as the British Empire expanded, the demand for Porters internationally grew. Trade between England and the Baltic countries led to the development of Baltic Porters which incorporated characteristics of higher alcohol and higher hopping (to last the long voyage).[22] At home in England, the desire for stronger Porters also increased and the more flavorful and slightly higher alcohol beer became known as a Stout or Robust Porters. Eventually, the word 'Porter' was dropped and a new style was born: Stout.

In the 1800's in Britain as Porters were beginning to decline in popularity, Arthur Guinness made the conscious decision to brew only the stronger version of the traditional Porter.[23] He also dropped the name Porter and began referring to his beer as Stout. The global desire for

[18] http://www.trappist.be/en/pages/trappist-beers.

[19] Oliver (2012, Oxford, pp. 2–3).

[20] Ibid, (p. 797).

[21] Oliver (2012, Oxford, pp. 660–661).

[22] "What to Expect: Stouts and Porters", *All About Beer Magazine*, Vol. 34, May 2013.

[23] Oliver (2012, Oxford, p. 770).

Stouts created several sub-styles such as Imperial Stouts (shipped to Russia and the Baltic states) and Foreign Extra Stouts (shipped to the West Indies).[24] One of the major differences between modern Porters and Stouts is the use of Black Patent Barley to create the dry, intense flavors and aromas in Stouts. Porters that use roasted malts such as Chocolate and Black malts can often be seen to exhibit more chocolate characteristics while Stouts are center around the coffee spectrum.[25]

The development of new Porter and Stout styles include the addition of many different flavoring ingredients such as vanilla, coffee, maple syrup etc. These once forgotten beers are now finding resurgence in interest by brewers and consumers alike.

Style	IBU	Colour	Malt Characteristics	Hop Characteristics	Body/Other
Porter	40+	Light brown to black	Noticeable dark malt flavors of chocolate, toffee, dark fruit	Medium to high bitterness but generally lower in hop aroma or flavors	Medium to high body
Dry Stout	40+	Black and opaque	Dry, roasted, coffee like malt character with hints of caramel and sweet biscuit flavors	Medium to high bitterness but little or no hop flavors and aromas	Medium bodied with little or no ale fruitiness
Sweet Stout	40+	Black and opaque	Assertive malt sweetness (often caramel tones)	Low levels of bitterness with no hop aroma or flavors	Mild roasted grain, coffee-like flavor—medium to full body
Oatmeal Stout	40+	Black and opaque	Malt overtones of chocolate and coffee with hints of molasses	Medium to high bitterness but little or no hop flavors and aromas	Medium to full bodied with a smooth mellow character
Imperial Stout	40+	Dark copper to black and opaque	Rich, intense maltiness with strong overtones of caramel, coffee and molasses, dark fruit	Medium to high bitterness but little or no hop flavors and aromas	Full body with higher levels of alcohol

[24] "What to Expect: Stouts and Porters", *All About Beer Magazine*, Vol. 34, May 2013.

[25] Mittag (2013, Prud'homme, p. 16).

Pale Ales and India Pale Ales (ipas)

In the late 1700s, another advancement in technology created the opportunity for another unique style of beer. The development of coal as a heating source changed the business of malting. With the advent of a controlled heat source, it was now possible to malt grains gently, thereby created lighter colored malts. Burton-on-Trent was a critical brewing center in England and the maltsters of Burton were the first to develop special lighter colored malts.[26] These new malts soon found their way into the brewing recipes of other European brewers (pilsners, Kölsch).

These light colored malts also had the added benefit of a different flavor. Instead of the strong coffee, roasted aromatics and flavors that were associated with Porters and Stouts, brewers were now able to infuse caramel, toffee and bready notes into their beers.

This new style became known as Pale Ale; largely because the new burnt orange and amber hues were 'paler' in comparison with the black and reddish tones of the previous generations of ale. Pale Ales by all accounts can be traced back to Burton-upon-Trent, which is located in the Midlands near Manchester.

The water in Burton has for centuries been viewed to be mystical and quite high quality. Two hundred million years of sedimentary strata are responsible for providing the high levels of gypsum (calcium sulphate) and Epsom salts (magnesium sulphate). These two minerals of hard water helped to soften the bittering impact of hops and created a sharper, cleaner finish that the traditional sweetness associated with brown ales.

With the British Empire expanding through colonization, it was only natural that beer accompanied those who resided in the colonies. In India, while the native beverage was referred to as Arak, there was a continued demand for beer. Arak was a full strength spirit and caused quite a few premature deaths in India, most likely attributed to alcohol poisoning or malnutrition[27] (beer has nutrients that spirits do not). With the need for nutrition and a drink less fatal, the British colonists turned mainly to Porters. With the new Pale Ales being in high demand back home, the interest in importing Pale Ales increased. Using similar techniques as was developed with Porters such as high levels of hopping and higher alcohol, Pale Ales were soon able to be transported the 6,000 nautical mile journey to India without spoiling. Interestingly, the new name India Pale Ale was not created because of the geographical destination but because of the transport company—The British East India Company.

Modern Pale Ales and IPAs have taken two separate paths. The more traditional view on these styles is more closely associated with the British versions and is decidedly more malt driven with an emphasis on caramel, toffee and darker

[26] Oliver (2012, Oxford, p. 638).

[27] Ibid, (p. 483).

breads. The hopping is more subdued and leans more toward the British noble varieties that have herbal, earthy and floral aromas. The American versions are bolder and focus more on the hop aromatics and flavor of West Coast hops such as Cascade and Citra.

North American Beers

Since 1984, North America has led the world in brewing innovation. The craft beer revolution has opened the door to creativity and innovation. Brewers are now going back to their historic and artisanal roots and are developing new hybrids of beer styles. While the development of North American lagers can be attributed to European Pilsners, it is important to examine two very unique styles of beers that were brewed on the two coasts of America at approximately the same time in history. In both instances, the development of these beer styles was largely determined by the immigrants who settled in the areas.

Steam Beers (California Common)

In California, the lager craze was strong as Germanic and Bohemian brewers brought their love of their homeland beers to the United States. These brewers had lager yeasts (most likely spirited away from Europe in secrecy) but no methods of using refrigeration since there was very little ice and the technology had not found its way across the continent. The name 'Steam Beer' became associated with these new hybrid beers in part because of the use of steam power and also because of the sounds emitted by carbon dioxide from the fermenting tanks and casks (quite often a secondary fermentation called Krausening was used).[28] Some also believe that the steam that rose from the fermenting vessels as it cooled resulted in the nickname. The end result is a beer (lager) with slight fruity notes on the aroma with the thirst quenching body of a lager. The name 'Steam Beer' is now a registered trademark of Anchor Brewing Co. and the style has been renamed—California Common.

Cream Ales

Cream Ales were the invention of immigrant brewers based on the East Coast and more specifically in the North Eastern U.S. and in Southern Ontario. Many of the brewers in these regions were originally from Britain and therefore brought their familiar beer styles such as Pale Ales, British Milds and Brown Ales with them. While ales were the dominant beer that was being brewed in the late 19th century and early 20th century, there was an ever increasing interest in these newer lager styles. Ales had always been fermented at warmer temperatures and therefore required very little refrigeration. With the introduction of controlled refrigeration by Carl von Linde, brewers were now able to brew all year and were able to control fermentation times and temperatures to suit the desired result of the master brewer. The growth of golden lagers in Europe were certainly a driving force in the creation of new brewing techniques in North America.

Innovative ex- pat British brewers now took ale yeasts and fermented their beers at colder (lager) temperatures and aged (lagered) their beers for longer period of times. Aging moved from 3–4 days to 10–14 days and the end result was a beer that had the fruity aromas of ales and the smooth, thirst quenching characteristics of lagers. One of the first hybrids was born and was christened as a Cream Ale (a lighter, creamier version of a traditional English ale)

Conclusion

Beer cultures and styles have evolved immensely since the dawn of civilization. Originally, brewers were required to use the materials that were geographically relevant. In a global community, we now have access to a wide variety of ingredients that are grown in unique geographical regions. We are using organic hops from New Zealand because the plant is not subject to same kind of diseases that exist in older growing regions. Brewers are working with malting companies to create regional varieties of grains that will allow for geographically centered brewing—estate breweries where all ingredients are grown nearby.

While we continue to witness an immense revolution in modern brewing styles, the great majority of existing beer styles in the world is geographically centered. Beer styles were invented or created based on the climate, soil and geography of each major beer region and also because of trade routes that required innovative brewing techniques that were representative of that region. To further entrench the importance of geographical relevance, brewers are creating appellations that preserve the regional aspect of brewing.

The trend in the brewing world is one of innovation. Since the early 1980s, we have witnessed an explosion of interest in beer. New styles are being created every day and many of these styles will hold geographic significance. With the advent of geographical protections sanctioned by global or regional governing bodies, this will only serve to entrench quality appellations into the beer community. It may not be that far removed to expect an appellation for West Coast IPA's, Caribbean Foreign Stouts or even a beer that requires 1 year old Kentucky Bourbon barrels like Scotch.

[28] Jackson (1997, Beer, p. 233).

Appellations help us to understand where we've come from and help us to map out where we are going.

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Part II

Environment

The Global Hop: An Agricultural Overview of the Brewer's Gold

8

Peter A. Kopp

Abstract

A volume on the geography of beer would be incomplete without a detailed overview of hops, the ingredient that adds bitterness and aroma to beer and acts as a preservative. This chapter explains how European civilizations first used hops in beermaking by the ninth century, and how farmers and brewers spread knowledge of its cultivation to temperate regions across the world. Physical, cultural, and economic geographies have played crucial roles in this story. The history reflects how plants, people, and ideas engaged in global exchanges over centuries as a means to achieve agricultural and brewing success. In the twenty-first century, commercial hop growing occurs in many temperate regions of the world. But that was not always the case, and understanding how this specialty crop developed helps us better understand the contents of our beer glasses.

In the closing years of the twentieth century, the hop became an icon of the "craft beer revolution" that swept across the United States. As brewers from the Pacific Coast to New England eschewed traditionally bland American lagers in favor of more complex recipes with quality ingredients, they almost universally featured more hops in their malted concoctions. The "hopped up" vats created more flavorful and aromatic beers, making them more akin to European specialty varieties than anything seen in U.S. markets since before Prohibition. The hop also became an effective marketing tool. Breweries featured hop plants and cones on their beer labels and branded them with names such as Hop Czar, Hop Henge, Hop in the Dark, and even Hopportunity Knocks. By the early twenty-first century, it was arguable that whether beer drinkers or not, American consumers encountered hops on a daily basis via television commercials, billboards, or grocery store shelves. The hop truly achieved star status.

Yet the hop's significance to brewers and beer drinkers has a history and geography that extends far beyond recent events. Prior to ending up in today's porters or IPAs, the hop took part in a global journey that has been in motion for well over a thousand years. The story began with the growth of European beer making traditions that relied upon hops and expanded during subsequent diasporas that spread European brewing cultures across the world. Over time, hop agriculture transformed physical, cultural, and economic geographies of temperate regions across the planet. Like the climbing plant, those transformations entangled stories not only of brewers and beer drinkers, but also of farmers and their land, businesses, scientists, and government agencies. This chapter on the global hop, with a particular focus on Europe and the United States, connects the geography of beer to a specialized agricultural crop.

The Botany of Hop and the Plant's Early History and Geography

The term *hop* refers both to a plant in the Cannabaceae family (with its closest cousin being *cannabis*) and its cones.[1] There are three species of the plant, but brewers only covet one

P. A. Kopp (✉)
Department of History, New Mexico State University,
Las Cruces, NM 88003-8001, USA
e-mail: pkopp@nmsu.edu

[1] The phrasing of *hop* and *hops* can be confusing, but is simply of matter of singular and plural usage of the word. Making a comparison to another plant is helpful. For example, one uses the singular form to speak of a lone apple or apple tree, whereas one would use the plural to refer to a bushel of apples. Similarly, one might speak of a single hop plant or hop variety, while one would speak of the many hops in the vat.

M. Patterson, N. Hoalst-Pullen (eds.), *The Geography of Beer*, DOI 10.1007/978-94-007-7787-3_8,
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Fig. 8.1 Global Hops Production, 2010

of those, the common hop (*Humulus lupulus L.*) native to Eurasia and North America (Hieronymus 2013). The hop is a perennial that produces annual bines that can climb up to twenty feet or more per year. To support this growth, the plant maintains deep root systems that can extend up to fifteen feet into the ground upon maturity. Subsequently, as discussed in a previous chapter in this volume, the hop requires deep, loose, and fertile soils. Geographies of specific places are essential to this botany. The hop only grows and produces well at latitudes 30–55 degrees on either side of the equator and in climates that provide winter frosts for required dormancy, wet springs to initiate rapid growth, and dry summers to stave off pests and diseases (Neve 1990). In other words, the plant grows best in specific physical geographies of temperate regions around the world (Fig. 8.1).

According to the best available records, the Roman naturalist Pliny the Elder first documented the common hop nearly 2,000 years ago (Hornsey 2003; Cornell 2010). In *Naturalis Historia*, he noted that the ancient Europeans called the plant *lupus salictarius*, often translated as the "wolf of the willow"—perhaps because its climbing bines suffocated willow trees with their rapid growth throughout the spring and summer. While various cultures across Europe brewed beer in classical times, there is limited documentation of hops used in the brewing process. Instead, gatherers of wild hops found uses in the bines for twine, tender shoots for food, and cones for medicines. The hop had likely been adapted for these reasons by various civilizations for thousands of years, not only in Europe but also in North America (Hieronymus 2013; Neve 1990).

If beermaking proliferated throughout ancient Europe, what did brewers use to flavor and preserve their beer if not hops? The answer is extensive. According to one scholar, beermakers used nearly two hundred different plants and spices prior to the fixation on hops. Some of the most common ingredients in these beverages (often called gruit or gruit beer) included dandelion and heather, but the list also included cumin, willow, juniper, moss, and St. John's wort. Like good cooks anywhere, early brewers experimented with available ingredients and adjusted their recipes over time. Fundamental in this quest for the best beer was, again,

Some confusion arises because, as noted above, the term hop (or hops in the plural form) refers to both the plant and it cones.

geography. The earliest beer pioneers collected ingredients by foraging the countryside around their homes (Hornsey 2003). Although it would be hundreds of years after Pliny wrote *Naturalis Historia*, brewers eventually discovered the value of the hop in the same way.

There are debates on the exact origins, but it is generally accepted that Western Europeans first added hops to their beer in the eighth and ninth centuries (Hornsey 2003; Hieronymus 2013). The hop provided a remarkable addition to the medieval brewer's trade. These gastronomical alchemists came to rely on the bitter acids of hops to help balance the sweetness of malted grains and on the essential oils to infuse pleasant aromas. The soft resins of *Humulus lupulus L.*, found in the cone's inner yellow lupulin glands, also exhibit strong antibacterial activity and thereby acted as a preservative for beer.

The first generations of beermakers who used hops did not cultivate the plant. Instead, they gathered it from the wild, just as had their ancestors. Brewers in Bavaria (in present-day Germany), likely the first to use hops, found the ingredient rather easily. Wild hops grew abundantly in German river bottomlands and forest margins, where they can still be found today. Brewers likely added the whole cones to their vat upon collection in the late summer and early fall. Over time, they also began to dry the cones and store them for uses later in the year. These adaptations informed future agricultural practices (Hornsey 2003).

The Cultivated Hop in Europe

Expert hop scientist R. A. Neve suggested that the 736 CE records of a "Wendish prisoner in the Hallertau district of Germany" offer the "earliest written evidence of hop cultivation" (Neve 1990). Little is known about the individual, and it is uncertain why he grew the plants. Nevertheless, records indicate that shortly after that date, Bavarian monks began planting hops. Perhaps the plant added some charm to their gardens in the summertime with the bines climbing high and the hop cones hanging throughout. More likely, these early cultivators harvested hop cones for medicinal purpose and began using hops in beermaking. The trend in hop growing spread as the plant became more commonly used in brewing over the next century. Monks and noble families facilitated the process (Denny 2009; Hieronymous 2013).

By the end of the ninth century, hop growing for the purpose of beermaking expanded from Bavaria to Bohemia (in the present-day Czech Republic), Slovenia, France and other temperate regions of continental Europe, underscoring the geographical importance of cultural diffusion. In the early spring, growers planted rootstock in evenly spaced hills (or mounds). After shoots emerged, the grower trained the bines clockwise to timber posts, as they would not climb if trained counterclockwise. Come summer, the plants matured and by late summer or early autumn hop cones adorned the plant from top to bottom. Families and neighbors then handpicked the cones after the poles had been laid to the ground (Hornsey 2003). Success in the process, like any other agricultural activity, depended on trial and error. Hop growers searched for and discovered better ways to encourage growth and productivity, whether it was improvements to training bines or methods of fertilization (Fig. 8.2). Intercontinental travelers helped the agriculturalists by spreading both knowledge and plant material in efforts to improve cultivation. That process continued over generations and would significantly improve hop farming (Barth et al. 1994).

The most important activity to take place in early hop agriculture was the selection of hop rootstock for planting. Again, geography proved essential. Although the common hop could be found across Europe, individual regions had specific varieties that had adapted to local climates and soil regimes. Beermakers and agriculturalists selected the hardiest and most productive plants, and those that also offered the best qualities in flavoring and preserving beer. The selecting created regional hop varieties that produced unique beers across the continent. Brewers and beer aficionados in the twenty-first century will not be surprised to know that hops from different regions possessed characteristics that made certain beers distinctive. The first German hops under cultivation included the Hallerteau, Tettnanger, and Spalt and the first in Bohemia was the Saaz. These hops have been long considered the world's finest because of their balanced bittering and aromatic characteristics and for that reason have been deemed "noble hops." All of the noble varieties are as revered in the early twenty-first century as they were in the era of the Crusades (Barth et al. 1994).

Following the successful rise of hop agriculture across Bavaria, Bohemia, and surrounding regions in Western and Central Europe, the practice spread to other temperate parts of the continent. In the thirteenth century, the Hanseatic League played a crucial role in transporting hop culture, as the German trading organization adopted hops as the standard preservative in beer; the decision affected not only German beermakers but also those who traded with the German states (Hornsey 2003). While brewers in some regions relied on the importation of what they saw as the ideal German product, many began to cultivate local hops for their own supply. Hop agriculture spread to Scandinavia and Russia, and, by the sixteenth century, English brewers also embraced the hop as an essential ingredient in their brews. As was the case in continental Europe, an infusion of both hop plants and knowledge regarding hop agriculture allowed for this transformation. By 1700, English growers dedicated

Fig. 8.2 Hops on the Bine at the Rogue Hop Yard in Oregon's Willamette Valley. (Courtesy of Rogue Ales and Spirits)

approximately 20,000 acres of land to hop cultivation, largely in Kent, Sussex, Surrey, and Hampshire (Cordle 2011). At that time the preferred hop variety was the Farnham Pale, later appropriated in Kent and renamed the Canterbury Whitebine. By the century's end, the Golding variety—selected from a field of Canterbury Whitebines—became the standard hop used in English beer (Darby 2005). Similar stories explain the nomenclature of hop varieties grown across the world.

In England and across Continental Europe, the expansion of hop growing coincided with the expansion of beer culture. As populations recovered from the trying years of the Black Death in the fourteenth century, the numbers of brewers who relied upon the hop increased. A general approach to brewing also changed. In the early modern period, the cottage industry largely run by women (alewives) transitioned into larger-scaled urban operation run by men (Hornsey 2003). These beermakers became more professional, joining brewing guilds and adhering to specific codes that included the requirement of using quality ingredients. During this time, beer solidified itself as an important part of Northern European culture, namely because the fermented beverage offered a safe alternative to polluted or diseased water supplies. Production grew as populations increased, and hop growing also expanded. Farmers began to dedicate more land to the crop, far more than could be used in a household or small community, as had been the previous practice. As a result of increased volume, large hop-trading networks emerged that funneled hops to brewers across Europe. Nuremberg, Spalt, and London arose as the largest centers of the hop trade where formal inspectors judged hops for quality and began to offer local seals of approval. That, in turn, aided in the production of quality beers (Barth et al. 1994).

A commercializing hop trade created greater competition among growers to cultivate quality products and inspired more intensified exchanges of agricultural knowledge. Universities and agricultural societies in the central hop-growing regions assisted with research that helped developed more

productive cultivation methods. Nothing aided farmers more than the proliferation of print culture from the sixteenth century onward as hop growers began publishing guides for distribution. One of the most famous of these guides was Reynolde Scot's *A Perfite Platform of a Hoppe Garden* (1576), an English treatise that provided detailed advice on the preparation, cultivation, and harvest of hops. The written discourse outlined the nuances of preparing hills (or mounds) for planting, selecting poles, training vines clockwise for upward growth, and combating various pests and diseases. Scot also described the oast house, the English term for the building where growers dried their hops. He outlined the construction of the two-storied structure where growers laid hops across the top floor and dried from the heat of a kiln underneath. Finally, Scot emphasized the best ways to dry uniformly for shipping. His guide and similar publications played an essential role in improving hop growing for future generations. The result of these works could be seen in the physical environment, as Europeans planted evermore hop gardens and constructed hop dryers by the thousands.

The benefits of new agricultural knowledge and increased productivity in hop growing also came with its share of problems; chief among them was the strain on labor resources for the harvest. Once able to rely on family members and neighbors, hop growers came to depend on hiring seasonal help toward the end of the summer and early fall. As hop growing became more commercialized, most European growers solved the problem by hiring a temporary pool of lower class laborers. The workers camped for the duration of the harvest season and engaged in the daily task of pulling cones from the bine. Because the work was unskilled, entire families participated, with men, women, and children of all ages earning wages according to the weight of their hauls (Barth et al. 1994).

By the nineteenth century, recruitment of harvest labor became vital to the success of hop growers across Europe. While the larger growers in Continental Europe looked to labor sources outside of their immediate locales, the most storied tradition emerged in England, where rural hop growers made great efforts to recruit from London's growing population. The city's poor and sometimes middle class families ventured to the hop-growing regions. In some cases newspapers glorified the event as a paid vacation. Some participants saw the opportunity as a sojourn from the city to enjoy country life and even a festive atmosphere. But the reality for many with poor temporary living and working conditions was quite the contrary (Lawrence 1990; Cordle 2011). Charles Dickens, for one, noted, "I have been amazed…by the number of miserable lean wretches, hardly able to crawl, who go hop-picking" (Maezials et al. 1908). The issues of seasonal labor soon became an important part of hop agriculture as it spread to different locales in the world's temperate zones, where records describe similar competing perspectives regarding laborers and labor conditions (Tomlan 1992; Vaught 1999).

The Hop Diaspora and the Rise of American Growing

Between the sixteenth and nineteenth centuries, Europeans introduced their brewing culture across the globe. German, British, Dutch, French, and Scandinavian immigrants hauled brewing kettles and beer recipes with them to settlements in Africa, Asia, Australia, and the Americas. Hopped beer offered colonists a source of calories and a reminder of home. Most importantly, the beverage still proved safer to drink than water from polluted and diseased sources. Given this information it should not come as a surprise that colonists in many areas of the world constructed breweries as some of the first buildings within forts or town sites. Along with the planting of grains, fruit orchards, and other European crops—not to mention the importation of cattle, sheep, and other nonnative animals—the process became part of the Europeanization of the globe (Crosby 1986). But how did colonial brewers obtain the spice of their brew in regions distant from commercial production? As early as the 1650s, members of the Dutch East Indian Company faced this question in South Africa as did English settlers in Australia by the 1790s. In these instances, brewers sought local farmers to grow hops but mostly had to rely on expensive imports from Europe (Barth et al. 1994) (Fig. 8.3).

In colonial North America, records of the Massachusetts Bay Company indicate that along with hopped beer, hop plants arrived with Puritan immigrants as early as the 1620s (Mittleman 2008). Finding conditions similar to their home countries, Dutch settlers in the New Netherlands (or present-day New York and the Mid-Atlantic states) and English colonists from New England to as far south as Virginia planted European hops in small plots. Some ambitious beermakers sought out the American subspecies of wild hop (Tomlan 1992). But those plants never caught on.

Early American beermakers had good reason for not embracing local wild hop varieties. The recipes upon which they learned their craft called for hops from their homelands that had specific taste profiles. Brewers faced the choice of importing hops from Europe or trying to grow European hop varieties themselves. Over time, the latter option became preferable given the expenses of importation and as colonists discovered favorable growing conditions in climates and soils. Not only did the temperate regions of eastern North America share similar climates as Europe, but they also benefited from virgin soils that had not been under intensive cultivation. To their luck, colonists discovered that growing conditions in North America could produce more

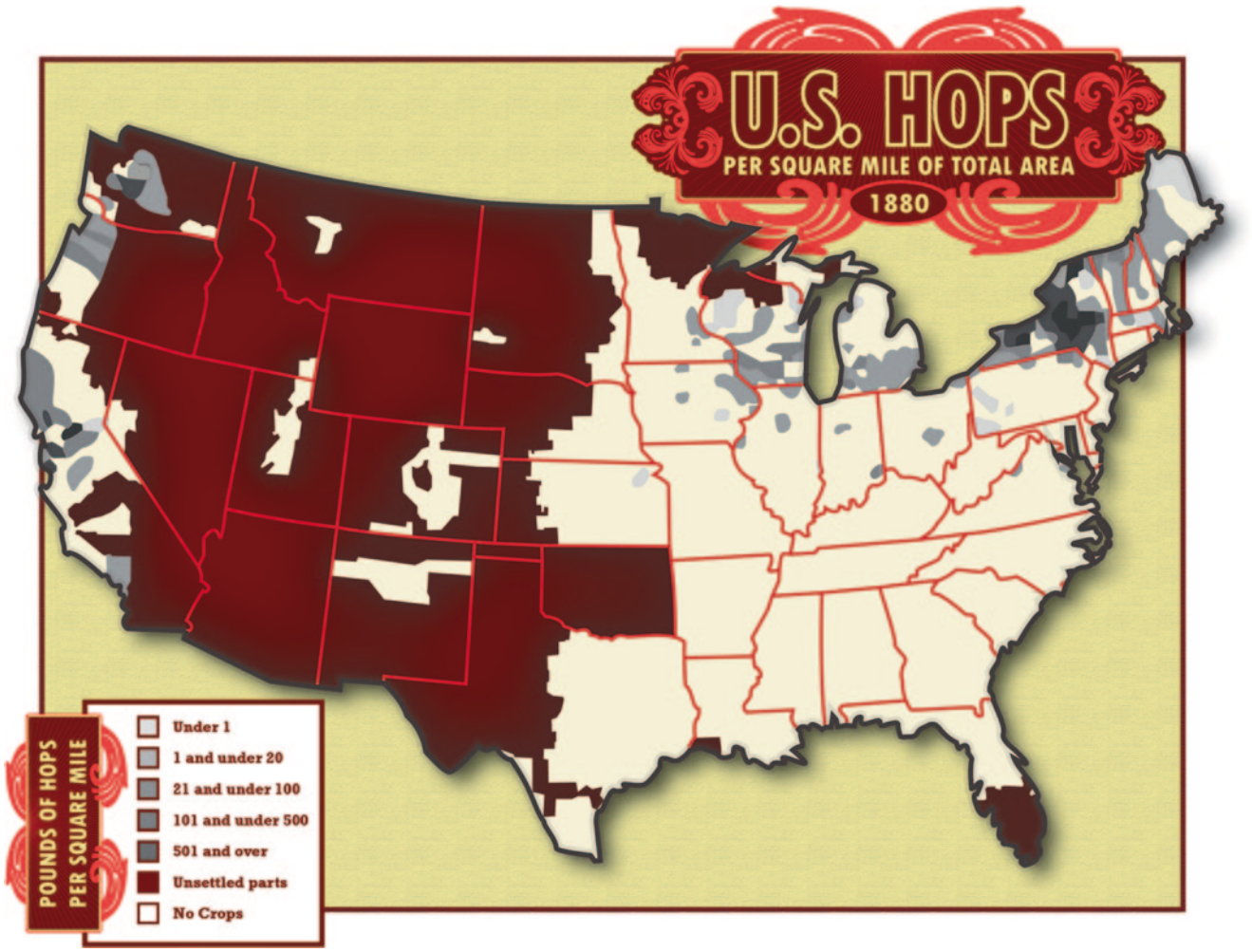

Fig. 8.3 U.S. Hops Production, 1880

hops per acre than many of the hop-growing regions in Europe. Throughout the colonial era, hop raising occurred at the household level with families growing small plots for their own brewing and possibly their neighbors. Change eventually occurred in response to national and international demand from an expanding beer industry in population centers around the world (Tomlan 1992).

By the early 1800s, New England and New York farmers had established the first commercial hop operations in the United States. These agricultural pioneers grew mostly English hops given that the two region's shared climactic features; American growers also found more buyers in the British marketplace. Yet, competition was fierce. Brewers in England and elsewhere often declared the American product inferior. Furthermore, American hop farmers did not yet have the advantage of a vibrant domestic beer market (Tomlan 1992). Consumers of alcohol in the early republic favored whiskey and hard cider. It was not until the 1850s that beer drinking increased. German and Irish immigrants brought with them a taste for beer. Additionally, in the wake of a temperance movement that sought to reduce American consumption of hard alcohol, beer was seen as an acceptable alternative. German lagers, in particular, won American favor for their lightness and drinkability compared to heavier ales in the English style (Rorabaugh 1979). It was under these circumstances that the Midwest became a center of American brewing, with German-American brewers including Busch, Miller, and Pabst successfully setting up shop just before the Civil War. States in the upper Midwest began commercial hop production at this time as well. Most of the large American brewers continued to shun those and other American hops in favor of continuing imports from Europe. Gradually, however, they concluded that the purchase of local hops was both cost effective and qualitatively competitive on the world market (Ogle 2006).

In the late nineteenth century, hop agriculture in the United States continued to expand where climate and soils permitted. Hop shortages in Europe also opened new opportunities for American growers. Farmers on the Pacific Coast took advantage of these opportunities and the already

operating agricultural marketing and shipping infrastructure that existed in the vibrant grain trade that existed between the West Coast and Europe (Kopp 2011). The Sacramento Valley in California and the western regions of Oregon and Washington offered excellent conditions for hop production, with climates and landscapes that resembled parts of England, Northern France, and Bavaria. The Mediterranean climate of Northern California and the windward marine climates west of the Cascades in Oregon and Washington proved more conducive for hop raising than even New York and New England as farmers generally avoided harsher winters and enjoyed drier summers. By the turn of the century, the Pacific Coast states surpassed the rest of the nation in production. The swift rise of hop agriculture in the Pacific region made the United States, along with Germany, the largest hop producers in the world by the early twentieth century (Myrick 1904).

Farmers in the Far West developed hop growing in the same way that their predecessors had in the eastern portion of the country. That is, they transported an established agricultural system from England and Europe. Farmers studied agricultural guides and market reports, and they shared the information with one another. In Washington, an outspoken entrepreneur named Ezra Meeker became the face of the newest hop growers. He traveled to centers of hop production in the United States and Europe, learning agricultural techniques and markets from experts. In the process, he became well regarded in the world of hops and beer, even earning the right to judge hops at local and national competitions. In part to improve the reputation of Pacific Coast hops and in part to generate business for his agricultural supply company, Meeker tapped informational expertise from where he could obtain it and brought it home for farmers on the West Coast (Meeker and Diggs 1922; "Hop Growing in the Pacific Northwest" 1882).

In 1883, Meeker published *Hop Culture in the United States*, a treatise that harkened back to the writings of Englishman Reynolde Scot. The work included regional recommendations for timber posts and sprays used in pest prevention, as well as variances on cultivation techniques from Europe. Meeker explained that one of the major differences between American and European hop growing was the size of each operation, with American hop gardens being much larger than those in Europe. His readers understood that they could plant their hops spaced farther apart, thus leading to more productive harvests. Perhaps, most importantly, Meeker's book also included advice on acquiring enough harvest labor, one of the major challenges for hop farmers in the sparsely populated American West. He recommended recruiting from the various Indian tribes of the Puget Sound. The endorsement proved beneficial for growers as well as American Indian peoples who were transitioning to wage labor jobs. Pacific Coast hop growers also hired Chinese, Japanese, and Mexican workers to meet their seasonal labor needs. The labor situation offered another vital connection between hop operations across time and place (Kopp 2011).

The Corporatization of Hop Agriculture and the Role of the State in the Twentieth Century

Between 1880 and 1910, global consumption of beer doubled from 125 to 250 million barrels per year (Ogle 2006). Those numbers continued to rise in subsequent decades, not only in Europe and the United States but also in Latin America, Africa, and Asia. Brewers took advantage of scientific advancements and technological improvements in the industrial age to produce more beer and ship it more efficiently. They also achieved greater success in branding and marketing their products across the world. Rising global beer production put pressures on the world's farmers to produce more hops, a demand that growers met with assistance from corporations and governments (Barth et al. 1994; Mittleman 2008).

By the twentieth century, transnational hop trading companies offered networks and established methods to meet the world's growing hop needs. Two German companies, in particular, helped usher in the corporatization of the specialty crop. Joh. Barth and Sohn of Nuremberg and Simon H. Steiner of Laupheim streamlined international hop markets and better connected brewers from around the world to the central hop growing regions in Europe. Respectively started in 1794 and 1845 as small trading firms, Barth and Steiner vertically integrated throughout the nineteenth century to include new crops, storage systems, shipping facilities, and access to brewers. They utilized the strategies of industrial era big business to monopolize much of the European hop market. Seeing rapid expansion in the brewing industry worldwide, both companies established offices around the globe. By the early twentieth century, Barth and Steiner stood out as the world's largest hop dealers, providing breweries the varieties, quantities, and qualities of hops needed to keep pace with industrial era beer production (Barth 1994; Steiner 2004).

But the German dominance was not absolute, as American and English businesses entered regional and global markets. In the United States, German immigrant Emil Clemens Horst saw an opportunity in the fact that most European hop distribution firms bought and sold only European hops but did not deal in the American product. From the 1890s to the 1940s, Horst acquired thousands of acres of land in California, Oregon, and British Columbia and contracted with hundreds of growers in those regions to market and sell their product. Over time, he established marketing and sales offices in Sacramento, San Francisco, Portland (Oregon), Salem (Oregon), Chicago, New York, and London (Wheatland Historical Society 2009; "E. Clemens Horst Called By Death" 1940). Not one to shy from self-praise, Horst nonchalantly

remarked in 1916 that he was the "largest hop dealer in the world" (Commission on Industrial Relations 1916). Barth, Steiner, and a handful of English dealers may have disagreed with him, but the fact remained that Horst had achieved great success in the United States and even in the world market.

In 1904, Horst solidified a lasting influence on the global hop marketplace when he negotiated an exclusive contract between Ireland's Guinness Brewery and a large group of Oregon hop growers. Offering hops at a cost "appreciably less than the prices being charged by the English merchants" but "on par" in quality, the deal set in motion a long-term commitment by the brewery to West Coast hop growers (Dennison and MacDonagh 1998). While his methods in outbidding well-known English suppliers may have been cutthroat, Horst achieved early prominence as a champion of the Pacific Coast hop industry. The deal underscored the recognition that English hop growing was in decline. It also signified the growth and acceptance of American hops in a global marketplace that had always favored European products. This, of course, was good news for American growers, but not for England. In the years after the Horst-Guinness negotiation, a series of articles in the *London Times* and Portland's *Oregonian* revealed that English farmers took a grave view of the new competition and prompted Parliament to pass protective tariffs for domestic hop farmers (Great Britain and The Tariff Commission 1906).

New British tariffs underscored a broader trend in the willingness of governments to join corporations in their assistance to hop growers around the world. Government help propped up specialty farmers and national beer cultures. In the United States, Congress debated the tariff issue, too, but found greater promise in offering scientific and economic support through the Department of Agriculture. The USDA supported research of the global hop market and released several circulars, including "Agricultural: Hops" (1891), "Hop Cultivation in Bohemia" (1899), and "Hop Culture in California" (1900). Although offering only a handful of pages with statistics on production in the growing regions, the works demonstrated a collaborative ambition on the part of American producers and government to compete with older and more established growing regions in Europe.

After Congress passed the Hatch Act of 1886 that created state agricultural experiment stations, researchers began publishing localized bulletins to help hop farmers integrate new agricultural technologies. The most important development by the twentieth century was the introduction of trellis systems for the hops to climb, as opposed to timber posts. Studies found that a permanent structure saved money and labor, as growers did not have to remove and replace posts each year. Growers also found that the trellis system helped the productivity of their crops. The trend spread fastest across the U.S., but European growing regions and others in the world adopted these agricultural methods by midcentury. In the process, the landscape of hop cultivation drastically changed (Tomlan 1992; Barth et al. 1994).

Government supported hop-breeding programs further helped farmers to produce enough hops to meet rising global beer demands in the early twentieth century. In 1906, England's Wye College established the most important of these programs under the direction of plant pathologist E. S. Salmon (Darby 2005). The work entailed breeding thousands of new plants from cultivars brought in from around the world. Salmon and his team looked for promising hybrids with qualities ranging from higher resin content and productivity to disease prevention and reduced shattering of cones for shipping. The difficult process first required the cultivation of promising crosses and then an assessment of the hops in the field and their effectiveness in the brewing process (Hough et al. 1982).

Salmon and the Wye College program achieved success only after growing thousands upon thousands of crosses. In the late 1910s, hops born of European and North American parents showed promise of higher resin content, with the added bonus of disease resistance in some growing regions. Salmon released the new hops varieties in the early 1930s and 1940s with the names "Brewer's Gold," "Bullion," and "Northern Brewer." The new varieties promised much to the struggling English industry and other growers around the world facing a range of hop diseases. Their development marked success for Wye College and other fledgling research programs on hops (Hough et al. 1982; Darby 2005).

World War, Prohibition, Disease, and the Industrialization of Hop Agriculture in the Twentieth Century

All the while that the global hop industry modernized to meet the beer demands of the industrializing world, political and social forces continually changed patterns of beer consumption. In the United Kingdom, for example, licensing laws initiated upon the outset of World War I reduced hop production. In the U.S., where the Wilson Administration declared that "Food Will Win the War," hop growers also uprooted their fields and replanted them with grains, vegetables, and fruits (Horst 1919). Statewide and then national prohibition of alcohol as a result of the Eighteenth Amendment in the United States (lasting from 1920 to 1933) also inspired many farmers to abandon hop growing. The controversial experiment eliminated millions of gallons of beer that in turn threatened to ruin not only American hop growing but also cut off exports from Europe. Large brewing companies such as Anheuser-Busch continued to manufacture "near beer" and so-called "nutritive tonics," or regular beer that could be prescribed by doctors. But that hardly made up for the reduction in normal beer sales. Brewers large and small

either stepped out of the business or succeeded throughout Prohibition by transitioning to the production of soda, yeast, chocolates, or other goods. American hop farmers also had to change their production as a result of Prohibition (Tomlan 1992; Ogle 2006).

Those farmers who retained their hops during these years were wise to do so. As the world recovered from the Great War in the 1920s, beer consumption rose once again and spurred an increased demand for hops. In Europe, the agricultural sector recuperated faster than the industrial sector, but throughout the decade farmers could not keep up with global demands for hops. Mother Nature provided further complications for European hop growers during the decade, when in 1924, a botanical disease called downy mildew swept across Europe's traditional hop-raising areas. The disease devastated growers from Central Europe to England (Barth et al. 1994). For other hop-growing regions in the world, particularly the United States, opportunity grew out of disease crisis. So great was the need to import hops in Europe, Latin America, Africa, and Asia, that Pacific Northwest hop production expanded in spite of the nation's experiment with Prohibition (Feldman 1927).

With repeal of Prohibition in 1933, American hop growing continued to expand to the point of glutting the market. In 1936, Oregon alone had 26,000 acres of hops under cultivation (United States Department of Agriculture 1971). Oversupply brought global prices down, a problem deemed so problematic that governments in the main hop-growing areas of the world took steps to regulate production. Great Britain introduced the first Hop Marketing Order to restrict production levels and the United States followed. In an effort to raise prices, governments set limits on pounds that could be produced without penalty. Many in the industry credit the various marketing orders for driving farmers from the business, but the regulations continued until the 1980s (Barth et al. 1994).

Amidst economic and political issues, the lingering problem of disease continued to face hop agriculture, namely downy mildew. By the 1930s, the disease had not only destroyed European crops, but also put an end to the commercial hop industry in New York and hampered Pacific Coast outputs. Downy mildew attacks wetter growing regions, sharply reducing the output of plants while infecting surrounding soils. On the Pacific Coast, the particular moisture patterns of Oregon's Willamette Valley caused farmers there to suffer the most (Barth et al. 1994). While unfortunate for those growers, the situation opened an opportunity in the neighboring state of Washington. With aid of the U.S. Bureau of Reclamation in the previous two decades, the arid Yakima Valley now possessed irrigated lands in a dry climate and seized the opportunity to grow hops free of downy mildew (Pfaff 2002). By the 1950s, the Yakima Valley became the largest hop-producing region in the nation, a prelude to its status as one of the most productive regions in the entire world (Miller et al. 1950).

Outside of Washington, growers from Oregon to Germany faced a continuing battle against downy mildew and other diseases. While some combinations of chemicals helped in disease prevention, growers came to depend on planting more disease resistant hop varieties ("New English Hop Doing Well Here" 1937). Promising hybrids developed by E. S. Salmon at Wye College offered solutions. Growers across the world followed the English lead in planting Brewers Gold, Bullion, and Northern Brewer varieties of the common hop. The decision radically transformed the hop growing regions of the world, perhaps nowhere more than Bavaria and Bohemia. For the first time, these regions that served as the birthplace of hop cultivation grew different varieties than those adopted centuries ago. The varieties drew their lineage from widely diverse geographical regions around the world, or that is to say, growers came to depend in part on hops found on both sides of the Atlantic (Wye College Department of Hop Research 1953; Steiner 1973).

The continued threat of disease and the success of the Wye College hop hybrids inspired other hop-breeding programs. As had been the case for Salmon, breeding and experimentation took many years to find success and required a global exchange of agricultural knowledge and plant material. In the United States, the Agricultural Experiment Station in Corvallis, Oregon initiated a hop-breeding program in 1930. Only through the efforts of several scientists did the program achieve success in 1972, when plant geneticist Alfred Haunold released the Cascade hop. This first American hybrid, named after the looming mountain range to the east of the Willamette Valley, helped save the dwindling Oregon hop industry. It would become just one of two dozen new varieties Haunold released throughout his career, alongside many others bred from sister programs in Washington and Idaho. Farmers integrated the hops into their fields both as a means of disease prevention and because brewers sought new varieties in beermaking. The hops served the needs of large and small brewers alike. By the 1980s, certain varieties such as Willamette appealed to large corporate brewers, while lesser-known varieties piqued the interest of those immersed in the craft beer revolution (Haunold et al 1985).

Besides the integration of novel hop varieties around the world, the largest change in the mid-to-late twentieth century hop agriculture was the mechanization of harvests. Because securing labor for seasonal and intensive hop picking was endemic in hop-growing regions, growers in England and the United States tinkered with industrial picking machines by the late nineteenth century. As early as the 1910s, machines using conveyer belts and shakers to strip hop cones from the vines proved effective. However, their expense deterred widespread adoption by most hop farmers. Not until World War II with its labor shortages did true mechanization

occur. Millions left for war service, and those who remained flowed into the industrial workforce. Not wanting to leave hops unpicked on the vine during this period, American growers invested in the mechanical pickers. While expensive, the machines proved efficient and without the attendant problem of searching for a labor source (Hop Industry Productivity Team 1951). The use of mechanical harvesters continued after the war. By the end of the 1950s, the contraptions became commonplace across the U.S. and England. Hop growers in Germany, who had always maintained smaller acreages, were slower to embrace the technology, but did so by the 1960s, as would most of the hop-growing world (Neve 1990).

Other significant changes to hop agriculture in the second half of the twentieth century reflected broader changes in world agriculture. In addition to the mechanization of harvests, hop growers came to rely on the industrial tractors, plows, and sprayers that wheat, corn, and tobacco growers began adopting in the 1920s. Many hop growers also abandoned tried and true organic compounds for fertilization and disease and pest control in favor of synthetics, including, for a time, DDT ("Experience With New Insecticide" 1947). All the while, beer consumption steadily rose around the world because of expansive corporatization and marketing. The strengthened corporate hold on large breweries affected hop growers. The two groups signed long-term contracts, and both contributed to research programs. In the second half of the twentieth century, research programs developed hop pellets and hop extracts, used by most breweries around the world today. Pellets and extracts, in contrast whole hop cones, offered uniform levels of lupulin, enabling the brewer to be more precise in meeting recipe requirements.

Recent Developments in the History and Geography of Hop Agriculture

By the end of the twentieth century, the physical geography of the world's hop-growing regions looked much different than a century prior. Growers adopted trellis systems, new hop varieties, mechanical harvesters and other implements of industrial agriculture. These changes, along with the continued corporatization of beer and hops as well as government marketing orders, drove many small farmers out of the business. With a major exception in Germany where individual hop gardens remains relatively small, hop farms now were in the hundreds of acres.

The new hop agriculture also continued to develop in different temperate regions of the world. While nowhere as productive as Germany or the United States, hop farming took root in East Asia and Latin America and expanded in Southern Africa and Oceania. Each of these regions had individualized advantages and challenges. On the one hand, for example, growers in New Zealand and Australia could easily grow organic hops because downy mildew and other diseases had not yet migrated there. On the other hand, South African hops required artificial light to prevent premature flowering from cones. The latecomers to hop agriculture mainly served their own brewing industries that wanted a closer and therefore cheaper product, though some of those hops reached the international marketplace (Neve 1990).

At the end of the twentieth century, the most dramatic expansion in the global hop industry occurred in China—for two reasons: first, with a significant portion of the world's population and an expansion of beer culture, brewing companies sought local supplies of *pijiu hua* (the Chinese term for hops); second, transnational brewing corporations have looked to China to produce cheaper hops than the established regions in Europe and the United States. A vibrant agricultural research program helped Chinese growers find success, particularly in the arid Xinjiang Province, where farmers cultivated American Cluster hop varieties on low-trellises. The cultivation technique differs from the rest of the world, but exists because of the abundant labor supply that can handpick the crop at the lower height. Although these growing conditions are far removed from methods and regions that dominated the industry for hundreds of years, China emerged in the twenty-first century as the third largest producer of hops in the world (Barth et al. 1994).

A broader shift in beer consumption has also led to many changes in hop agriculture. The "craft beer revolution," ignited by San Francisco's Anchor Steam Brewing and a vibrant homebrewing culture of the 1970s, helped to redefine the tastes of American beer. A new breed of brewing pioneers desired complex beers that utilized hops liberally, as opposed to standard American lagers that used minimal amounts of hops and imparted little flavor or aroma. The new beers had flowery and fruity profiles as a result of brewers not simply adding more hops in their recipes, but also seeking out different varieties across the world—including hybrid varieties bred in agricultural experiment stations. The Cascade hop, in particular, won favor with craft operations such as Sierra Nevada Brewing in Chico, California. Into the 1980s and 1990s as craft brewing spread across the country, brewers sought out all newly released hop varieties and experimented with those still in the testing phase. Brewers befriended farmers that would grow small acreages of specific hops; some craft brewers, such as Oregon's Rogue Brewery, have also purchased their own hop farms in an effort to manage their own supply. The American public responded optimistically to these hoppier beers and more breweries emerge each year. In the U.S., this trend has inspired smaller hop operations to emerge outside of the Pacific Northwest. Yet, even with substantial growth, the market share of craft

beer remains less than ten percent. So the big beer companies dominant the amounts and varieties of hops produced commercially (Acitelli 2013).

In a reversal of a hop story that had persisted for half a millennium, the craft beer revolution in the United States inspired many brewers from around the world to abandoned their tried and true European roots of hopping beers and turn to beers hopped in the newer tradition. Brewers from Italy to Australia imported new American hop varieties and the trend inspired hop growers in those regions that had not already done-so to plant new varieties in their fields (Acitelli 2013). In some cases the hops caught on, but in others they did not. Still, in other cases, hybrid hop varieties took on different profiles when introduced to different soils and climates. This has been the case, for example, with the introduction of Cascade hops to growers in Kent, England. The hop is less aromatic and flavorful than those grown in the Pacific Northwest due to *terrior* (the term used in viticulture to describe the effects of specific soils and climates on grape production). But that has been welcomed in England, a region where the hoppy beers of the craft beer revolution have been slower to gain popularity.

The situation in England illustrates the weight of the new global trend of craft beer. Peter Darby, the country's current expert on hop agriculture (and professional descendant of E. S. Salmon at Wye College), has recently determined that to stay competitive, English growers need to turn specifically to aroma hops that capture the trends in the industry (Darby 2004). Undoubtedly, hop growers around the world have made similar determinations given the rapid growth of craft beer and consumers' love affair with the "wolf of the willow" in recent years.

Conclusion

While the common hop undeniably achieved star status during the "craft beer revolution" of the late twentieth and early twenty-first century, the plant has long been the essential spice of the brew in European beermaking traditions. For well over a thousand years, brewers have coveted hop cones to infuse flavor and aroma to beer, and to extend the product's shelf life. No other ingredient proved to be so useful. Because of that determination, beermakers and farmers over the generations worked together to ensure agricultural success of the hop, and they did so as European peoples settled in other parts of the world and as global beer-drinking populations rose. That story entailed the creation and dissemination of knowledge and the exchange of plant materials and technologies. Evidence of the history lies in the treatises of farmers such as Reynolde Scot and Ezra Meeker, the records of the Barth and Steiner hop companies, the notebooks of hop breeders such as E. S. Salmon and Alfred Haunold, and in the photographs of hop dryers and hop pickers on rural landscapes around the world. Evidence also lies in the flavors and aromas emanating from beer glasses in the twenty-first century.

Geographies of peoples and places are essential in the story of the global hop. First, the plant only grows in temperate regions of the world with deep, fertile soils. Although scientists and engineers have allowed more arid climates to support hop agriculture in the recent past, most of the history of hop cultivation also unfolded in regions that offered ample spring rains for natural irrigation. Second, the rise of hop agriculture in Europe depended on specific hops that had adapted to regional soils and climates. These hops, such as the Hallerteau, Tettnanger, and Spalt, in turn imparted regional flavors in beer. Third, as Europeans colonized other parts of the world from the fifteenth century onward, they brought with them this unique beer culture that depended on European hop varieties. Many brewers imported hops to their new homes, but most came to rely on the introduction of European hop agriculture to new areas. In that way, the hop—not unlike cereals or livestock—became part of the geography and history of the Columbia Exchange, particularly in the creation of Neo-Europes in temperate regions of the world. Rural landscapes changed as first hop poles and then trellises adorned farms, as well as two-story hop dryers. Various sources of labor, from London's urban populations to American Indian tribes of the Puget Sound, took part of this rural geography. Finally, in creating novel hop varieties that tested well with brewers and could resist diseases, scientists took advantage of global geography to breed hybrid varieties. Perhaps these newer hops best represent the plant's global journey. Many were born of hops native to different areas of the world and adopted by growers wherever hops can be grown.

As the late twentieth-century growth and expansion of hop growing in China and surge in craft beer and therefore hoppier beers demonstrate, the history and geography of the global hop is still in motion. The two largest areas of production continue to reside in Southern Germany and the Pacific Northwest of the United States. But obstacles, from disease transfer to market fluctuations, can quickly change the agricultural narrative; climate change may also feature prominently. Similarly, the introduction of new technologies and hybrid plants could also aide in the growth of a hop industry in regions that have yet to have a commercial presence. If one thing is clear, however, is that over the centuries the hop has solidified itself as the brewer's gold. And it is likely that as long as there are beer cultures, there will be hop cultivation. As such, the story of specialized agriculture will be continually linked to the geography of beer.

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Sweetwater, Mountain Springs, and Great Lakes: A Hydro-Geography of Beer Brands

9

Jay D. Gatrell, David J. Nemeth and Charles D. Yeager

Abstract

The geography of beer and breweries, like many industries, has historically been linked to natural resources and the location of critical inputs, notably rivers. While beer and other perishable foodstuffs were historically produced for local consumer markets, new technologies, distribution networks, and multi-national corporations have changed the market considerably and the result has been the dominance of a few large macro breweries serving global consumer demands. Yet, the emergence of new niche markets and the success of micro-brews has resulted in an explosion of regional and local craft production facilities and a renewed emphasis on local water-streams, springs, and lakes. In this paper, we examine the iconography and observed "hydro-geography" of selected local, regional, and even national products to understand the intersection between place and industry, and the geopsychology of competitive marketing strategies and stratagems.

Introduction

As any ancient Mesopotamian warrior, medieval Trappist monk, settler in America's "Old West", or contemporary global trekker with a Third World fetish will tell you, drinking beer is usually better and safer than the local water. Yet, water, beer, and the perceived quality of each are ironically and intimately linked to one another. As this paper will demonstrate, the unique geography, or more accurately hydro-geography, of beer has changed very little over time and across space. Using the U.S. beer industry and its global context as a framework, we examine the locational attributes and associated iconography of "more local" regional craft beers, branding, and the persistent interaction between place and industry that ferments the competitiveness of firms (and brews) in a global marketplace.

The author order is alphabetical and as such the work represents a shared and truly collaborative contribution.

If I wanted water, I would have asked for water. Slogan for Labatt's Blue

Location Theory and Beer in America

> Growth in regard to geography will depend on our ability to produce and ship quality product.
>
> Yuengling (2012)

One of the first lessons every novice economic geographer learns is Weber's Theory of Industrial Location (see Chapman and Walker 1991; Gatrell and Reid 2004). Weber's theory posits that industry seeks to optimize production by identifying locations that minimize transportation costs. The exact location of any specific facility is dependent upon

J. D. Gatrell (✉)
Bellarmine University, Louisville, KY, USA
e-mail: jgatrell@bellarmine.edu

D. J. Nemeth
Department of Geography and Planning, University of Toledo, 2801 W. Bancroft, Toledo, OH 43606-3390, USA
e-mail: david.nemeth@utoledo.edu

C. D. Yeager
Missouri Southern State University, 3950 Newman Road, Joplin, MO 64801-1595, USA
e-mail: cyeager2@sycamores.indstate.edu

M. Patterson, N. Hoalst-Pullen (eds.), *The Geography of Beer*, DOI 10.1007/978-94-007-7787-3_9,
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whether a final product is weight gaining or weight losing relative to industrial inputs (i.e., resources) and markets (i.e., consumers). Weight gaining products are located closer to consumer markets than weight losing products. Beverages are an example of weight gaining products, and production facilities are located closer to the final market. In contrast, petrochemicals (notably natural gas liquids) are an example of weight losing products and can be located farther from consumer markets. Beer, like many industrial goods, consumes a considerable amount of water throughout the manufacturing process and a pint of the final product requires between 8 and 24 gallons of water to produce. In short, water's heavy and beer production is market centered. As a result, a review of any label of Budweiser will reveal that, while the brand and corporate mythology revolves around its historical world headquarters in St. Louis, Missouri[1], the lager is more likely produced at one of the other 12 domestic production facilities serving more local markets (Anheuser-Busch 2012). In addition to production facilities, Budweiser brand beer is actually a component of a much larger vertically integrated manufacturing system that includes another 10 facilities producing and recycling cans, bottles, and lids. The same is true with respect to the distribution of carbonated beverages and corporate geo-brands such as Atlanta's Coca-Cola which boasts more than 300 bottlers around the globe (The Coca-Cola Company 2012).

While the beer industry is now global,[2] 100 years ago it was more likely that your beverage of choice was produced considerably closer to home using local water resources. Beyond resource issues, the local geography of beverages was also driven by capacity, transportation, and other everyday realities which are easily taken for granted. These realities include the efficiencies of our technology-rich global economy and multi-modal transportation networks that were not available in the 1900s. As such, the relationship among production, markets, and resources was critical. However, even today the nature of regional craft breweries, like D.G. Yuengling & Sons, continues to articulate the inherent spatial limits that exist on their market. While the U.S. beer industry is now dominated by a few U.S. and European multi-nationals, the spatial dynamics of the industry were historically fragmented and the industry was dominated by small firms and entrepreneurs. In 1870, the total number U.S. breweries peaked at 3,286 (Stack 2003). The majority of these breweries was located on rivers, lakes, springs, and/or had access to abundant ground water resources. Similarly, breweries were often regionally associated with the geography of grain products. Since grains are weight losing "rural" products and water adds weight to the final product, breweries were ordinarily located in cities and larger towns.

Beyond the physical geography, the expansion of brewing as an economic activity coincided with an influx of new immigrants to the U.S. While beer was initially brought to the U.S. by the Dutch and English during the colonial period, the explosion of local production occurred following large waves of German immigration in the middle 1800s (Stack 2003; Healy 2000; Holian 1990). As such, the geography of beer parallels the historical settlement of the nation—primarily along the Ohio and Mississippi River Valleys and Great Lakes. These locations provided access to grains grown regionally in states such as Indiana, Kentucky, Ohio, Illinois, and Iowa, in addition to an essential abundance of water. Additionally, German settlement patterns in Eastern Pennsylvania, New York City and Upper New Jersey contributed to a once significant (but largely now absent) concentration of breweries "out east." Following the Civil War, the geography of beer moved west where it was also associated with immigrants, primarily Germans, and water in locations such as Golden, Colorado (Adolph Coors and Jacob Schueler 1873—Coors), and Tumwater, Washington (Leopold Schmidt 1896—Olympia).

While a few beers from the west would gain national markets, the majority of national brands that dominated the post-prohibition era through the 1980s originated in this historical "beer belt", which shares the same basic geography of the North American Manufacturing Core. Major Beer Belt producers and historically significant firms included: Miller (Milwaukee), Budweiser (St. Louis), Stroh's (Detroit), Schlitz (Milwaukee), Falstaff (St. Louis), Blatz (Milwaukee), and Hamm's (St. Paul), with several notable East Coast breweries including Schaefer (New York City) (Fig. 9.1).

Prior to the 1970s though, the beer industry was highly regionalized and reflected the spatial fragmentation of the sector's historical geography. While many of the recognizable regional brews no longer exist, several regional beers have been maintained in the brand portfolios of macro-brewers and a few have continued as independents. Lakeside and riverine examples of regional brews include: Champagne Velvet (Indiana and Illinois), Rheingold (New York and New Jersey), Iron City Beer (Pittsburgh), Yuengling (Philadelphia, southern New Jersey, and Delaware), Lone Star (Texas), and Hudy (Cincinnati).

Between 1970 and 1980, the brewery industry consolidated considerably as competition between brewers grew, transportation improved, production processes became more efficient, and new preservatives and processes lengthened the shelf life of beer (Greer 1981). Today, restructuring has dramatically transformed the industry, and the result has been what Gourvish called an "oligopoly" (1984, p. 253). Since 1984, the consolidation of once popular regional brews has accelerated across North America (U.S., Canada, and Mexico), resulting

[1] Today, Budweiser is a brand of the global ABInBev which is now headquartered in Europe.

[2] The globalization of the beer industry will be address in other chapters in depth.

Fig. 9.1 Example waterside breweries and their distributions throughout the Beer Belt circa 1950

in a few dominant firms accounting for hundreds of national and once-regional brands. Currently, the major firms include Anheuser-Busch InBev (Headquartered in Belgium), SABMiller, Pabst (now located in Los Angeles), and MolsonCoors (which operates jointly in the US with SABMiller). As a result, only 132 independent breweries currently exist, including both macrobrews and regional craft production (Stack 2003; U.S. Brewer's Association 2012). This total increases to 1,054 when microbreweries with limited distribution networks are included. On the other hand, the industry's all-time low total (excluding the Prohibition era) was 89 in the 1970s (U.S. Brewer's Association 2012).[3]

Craft breweries have grown considerably following the passing of 1979s H.B. 1337 which permitted home breweries. The regional craft industry exploded in the 1980s with the launching of Samuel Adam's Boston Lager in 1984. As you will see, the emergence of the regional craft industry has transformed the industry, its geography, and its relationship to water as a resource and icon.

The Geo-Hydrology at Brew Sites in the "Beer Belt"

Water is a principal ingredient of beer, and plays an essential role in the beer production process at commercial brewery sites in the United States. As discussed earlier, direct access to a sufficient amount of appropriate water for brewing good beer and to other essential on-site needs purposes (making ice, for example) was once the primary consideration for the site-selection of breweries in historic industrial towns and cities. Thusly, we have delimited and mapped an area we define as the Midwestern "Beer Belt."

Many iconic labels and mottos associated with popular local, regional and national beer brands sharing Beer Belt

[3]This tallied number excludes brewpubs which are not associated with distribution beyond a single site or chain of firm-owned sites.

origins, as exemplified by those large commercial breweries on our Beer Belt map still extant in the 1950, are associated in the public mind with the virtues of the ground waters on the sites of their breweries when originally built; for example: Schlitz, Blatz and Pabst. Indeed, the significance of geo-hydrology (groundwater sources) at brew sites in the Beer Belt was once a primary locational determinant. However, the sources of suitable fresh water for brewing beer throughout the historic Beer Belt have changed over time. Breweries abandoned their original groundwater sources, instead turning to lakes, streams, or reservoirs to fulfill their water needs. Today, brewery use of on-site ground waters has drastically diminished to the point where most of the water used today in the brewing process consists of municipally-supplied and treated surface waters—in other words, "tap water." As we discuss, sources of brewing waters for these big breweries have changed over time, and these changes are result of changing geographies, technologies, and markets.

The growth of commercial beer production and consumption in industrializing Beer Belt cities began in earnest in the mid-nineteenth century. The famous Milwaukee breweries typify the beginnings of the Midwest lakeside beer boom, with the building of the Schlitz brewery—"The Beer that Made Milwaukee Famous"—in 1849. The rustic history of small scale beer brewing in the Midwest prior to the mid-nineteenth Century cannot be addressed in detail in the short space of this chapter.

Water: Place and Icon

> From the Land of Sky Blue Waters—
> Hamm's, St. Paul, MN
>
> Brewed with Pure Rocky Mountain Spring Water—
> Coors, Golden CO

Considering that beer is between 90 and 95% water, water quality and the specific geochemistry of water is critical to ensuring high quality brews in place over time. According to the *Reinheitsgebot*, or the German purity law, the only three ingredients to be used by brewers are water, barley, and hops.[4] While recipes have changed and now include various malted and un-malted grains such as rice, wheat, rye, corn, sorghum, yeast, and even advanced clearing agents, water remains the only constant. Given the highly variable nature of ground water, moving water, and flat water, the mythology surrounding the hydro-geography of beer is equal parts science, branding, and taste. Additionally, water and the hydro-geography of beer are also closely related to the market niche occupied by any brewer.

From the beginning, savvy entrepreneurs recognized that water quality and a facility's geography could be marketed. While the brewing process has change little over time and the primary cultural influences of the industry (i.e., Germans) led to the dominance of the lager style, branding became important. For many informed brewery owners, the physical geography of a facility and its local environs became the primary determinants that would frame the marketing of their product.

Despite the brand emphasis, the geo-hydrology of water does matter. Water quality does impact taste, and the overall success of many recipes developed in location A may not be as successful if brewed in location B. As a result, site selection for new facilities is a critical decision. In the case of Sierra Nevada, the decision to expand production beyond Chico, California at an east coast location was closely associated with identifying a high quality water sources (Glancy 2012). Indeed, the corporate brand is closely linked to the perceived quality of streams fed by melting snow packs atop the Sierra Nevada Mountains. While the site selected had access to a municipal water source, the company chose to dig a well and reported that they had hit a "glacial aquifer… that has big cobblestones in it, and to find these aquifer cobblestones underground is pretty rare, but when you hit one it's pretty phenomenal" (Glancy 2012). In addition to the location question, maintaining high quality in place has also been an important issue. Widmer Bros Brewing became actively engaged in anti-fluoridation campaigns in Portland, Oregon (Anderson 2012). While Widmer claims the effort won't impact flavor or aroma, their spokesman still asserts "It's a big deal for us" and the company opposed the proposed water treatment (Anderson 2012).

In contrast to the approach adopted by Sierra Nevada, a regional craft brew, the approach taken by macro-brewers has been decidedly more laissez faire—quantity and cost is a primary concern, not quality. Macro-brewers would likely dispute the notion that water quality is not a major concern. However, their assertion would be heavily dependent upon their specific market position, and the fact that the location of production facilities meet least cost conditions and enhance national markets suggests otherwise. As the industry consolidated over the past 30 years, the geography and water associated with macro-brewer brands has been of little importance to the bottom line as volume of production dominates the macro-brewer's business model. In the case of Olympia beer, which was originally brewed in Tumwater, Washington, the purity and quality associated with arte-

[4] The *Reinheitsgebot* was being enforced in Germany long before Pasteur discovered the role of yeast in the process of fermentation. Subsequently yeast was recognized as an essential fourth ingredient circumscribing the legal definition of what constitutes beer in Germany. The legal definition of beer in the United States of America is, not surprisingly, much less stringent. Theoretically anything goes into an American brew and some microbrew labels even tout their impurities to attract marginal demographics.

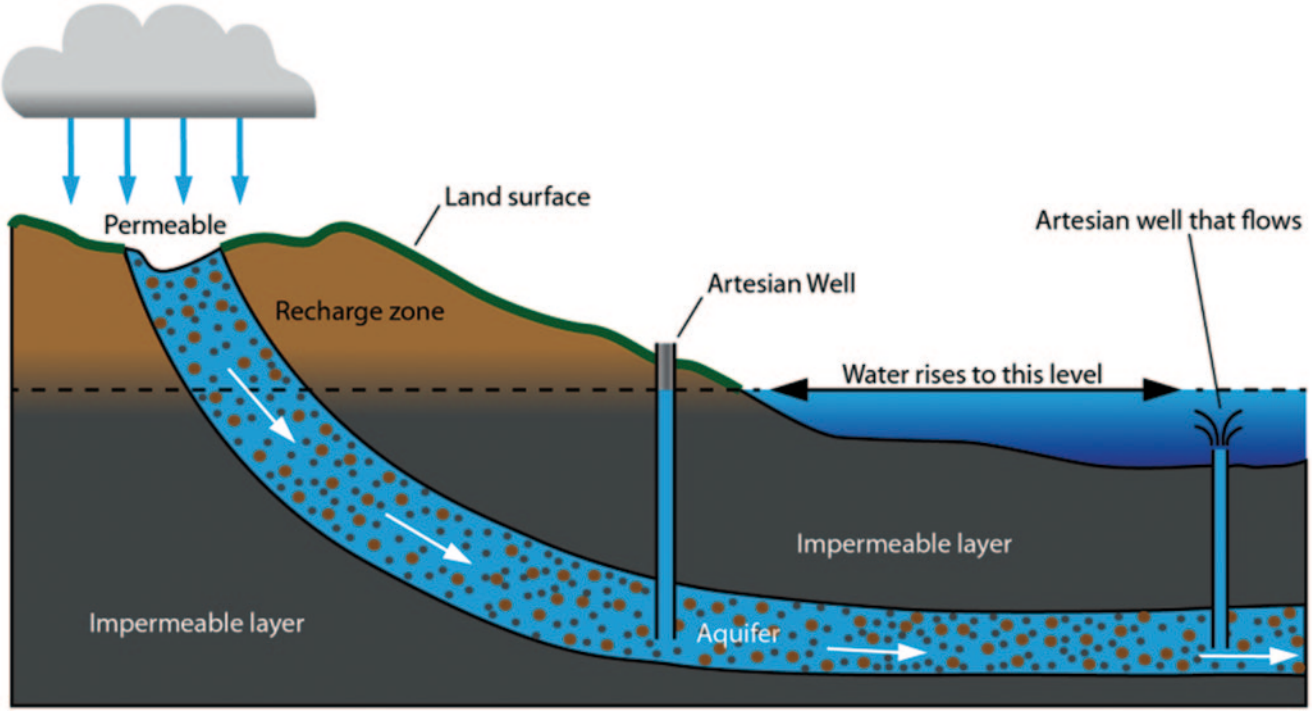

Fig. 9.2 Representation of an artesian well

sian wells (i.e., groundwater resources accessed through an impermeable layer and when situated below the water table characterized by positive pressure, see Fig. 9.2.), attributed jokingly by corporate executives with a mythical population of "Artesians," was a major component of the brand proclaiming "It's the water." While the brand is still available today, it is produced in Irvine, California by Pabst with no mention of artesian wells, although the label still proclaims "It's the water."

Like Olympia, Rolling Rock (Fig. 9.3) was a regional brewer through the late-1990s and gained national attention with the expansion of specialty beers and regional crafter brews. Brewed by the Latrobe Brewing Company in southwestern Pennsylvania, the company cultivated purity themes vis-à-vis glass lined tanks and mountain springs. Today, Rolling Rock is in the Anheuser-Busch InBev portfolio and produced in New Jersey—hundreds of miles from the mountain springs of old Latrobe. According to beer aficionados, the tastes and brands of both beers have suffered. The delinking of the brand and production process from a historic geography made competing in their traditional regional market more difficult and diminished the brand loyalty of local residents (Francis 2011).

We thereby argue that water does matter, as does geography. A beer is more than a brand—it's special, decidedly local. It's also essential to brew beer using high quality water with the right balance of minerals. Indeed, specific regions have long been associated with specific styles of beer—not because of their history per se, but the geochemistry. After surfing the internet even a novice Googler can identify that the noted hardness of the water at Burton-on-Trent, which contains sulfates and chlorides, produces high quality pale ales, whereas Munich's lagers are a result of carbonates. According to The Brewer's Handbook, pH, alkalinity, hardness (temporary and permanent) and minerals (calcium, magnesium, sodium, sulfates, chlorides, potassium, sulfates, nitrates, nitrites, iron, copper, and zinc) contribute to the taste and aroma of beer (Goldhammer 2008). In some case the specific chemistry (or combination of "water agents") impacts fermentation or enhances flavor. In other cases, such as iron, the result can be a metallic flavor. Even worse yet, as Goldhammer (2008) notes, beer brewed with water containing sulfates may produce a laxative effect. Luckily, water treatments can address poor water quality issues—but may also diminish the concentration of minerals and/or introduce other unwanted characteristics. Indeed, the issue of taste and denudation of local minerals is driving opposition in the anti-fluoridation initiative in Portland, Oregon.

Despite direct appeals to water quality (Fig. 9.4), representations and perceptions surrounding water purity have long been associated with beer quality. With the expansion of regional craft breweries and the explosion of microbreweries, geography and water are increasingly re-linked to the brand (Chappell 2012). While cans of Bud Lite feature over-stylized corporate logos, craft brews often gain some degree of credibility through physical geography and representations of it. In many cases, the imagery associated with the physical geography emphasizes waters, echoing many defunct re-

TO HONOR THE TRADITION OF THIS GREAT BRAND,
WE QUOTE FROM THE ORIGINAL PLEDGE OF QUALITY:
"FROM THE GLASS LINED TANKS OF
OLD LATROBE®
WE TENDER THIS PREMIUM BEER
FOR YOUR ENJOYMENT, AS A
TRIBUTE TO YOUR GOOD TASTE.
IT COMES
FROM THE MOUNTAIN SPRINGS
TO YOU"
"33"

Fig. 9.3 Photograph of a Rolling Rock bottle

Fig. 9.4 Grain Belt beer advertisement, Minneapolis, MN

gional brands. To build regional brand loyalty, microbrews and regional craft brewers emphasize geography and specific regional qualities—the pristine nature of "northern" lakes or even geographic features, such as Atlanta's Sweetwater brewery which is derived from nearby Sweetwater Creek.

Idealized representations of nature and how these locales reinforce the brand also differentiate craft brews in the market place by establishing craft and microbrews as the "other"—the non-macro brew. Indeed, the strength of the exotic other and regional craft brew identity has given rise to many faux craft beers under creatively named subsidiaries, sometimes reviving historically important regional brands or names, also known as decoys (Kesmodel 2007). Examples of these decoy brands include Batch 19 (SABMiller), Henry Weinhard's (SAB Miller), Blue Moon (SABMiller), Wild Hop Lager (ABInBev), and Leinenkugel (SABMiller). Some would argue that Samuel Adams (now owned by ABInBev) represents the most successful example of a faux craft beer.

The craft market is also technically, and perhaps legally, differentiated by water source. For example, Anchor Steam has argued that "water" differentiates the "craft" and "better brew" (i.e., high end macrobrew) markets. As part of 2011 litigation with the Boston Beer Company (a subsidiary of SABMiller), Anchor Steam argued that their single production facility and sole water source differentiated their "craft" product and market from the mass produced, multi-facility model used by Samuel Adams (Sankin 2011). The legal argument, associated with a non-compete agreement and an employment dispute, relied heavily on the assertion that craft beers and microbrews are produced with a single water source, while "better beer" brewers produce beer at multiple locations using multiple water sources. Assuming the argument has merit, the social construction of water and the hydro-geography of beer has socio-spatial implications above and beyond the issue of taste and quality.

Beer Belt Production Locations in Historical Retrospect

Access to sufficient amounts of potable water explains the history of successful human settlement worldwide, and in the Midwest. Historic European settlements in the Midwest were most often proximate to surface waters or where water tables were high and potable ground water could be easily accessed by digging shallow wells to tap into sub-surface water sources. But like birds, humans notoriously foul their own nests. Surface waters (springs, ponds, rivers, streams and lakes) within and adjacent to stable, growing settlements, while most useful for transportation purposes, were

increasingly rendered non-potable over time by concentrated residential, commercial and industrial pollution. For example, the name "Milwaukee" derives from a Native-American word that meant "settlement by the lake." Typical of many Midwestern lakeside cities, Milwaukee grew populous and prosperous early on thanks to its on-site "wet industries": breweries, tanneries and meat-packing plants. Wet industries in Beer Belt cities, from their beginnings, demanded a lot of water and produced a lot of sewage.

Prior to the building of the Schlitz brewery, some settlement-based Native-Americans and European settlers arriving in the western Great Lakes region produced fermented beverages, like maize and honey beers, barley wines and primitive ales. These home brews were perishable and notoriously unsafe to drink. Then came the Germans—named Schlitz, Blatz, Pabst and others—and with them came a sophisticated commercial beer production and consumption culture that centered on brewing lagers year-round for mass consumption.

German beer culture was a trait-complex of *artifacts* (breweries, beer gardens), *sociofacts* (beer festivals), and *mentifacts* (German lager brew recipes). Brew master *mentifacts* included their own personal, detailed knowledge of different brew waters and their treatments. This knowledge could be acquired only through long, grueling apprenticeships with immigrant brew masters, followed by a range of learning experiences at diverse locations in the Beer Belt. Indeed, many German immigrant beer brewers, upon reaching the Midwest, were remarkably footloose at first, only to marry and settle down later in life. Younger immigrant brewers moved about, from brewery to brewery, throughout the Midwest while seeking more prestigious employment, better wages, and enhanced reputations. During their peregrinations they learned the extent to which local water sources at brewery sites were unique. Geo-hydrology mattered: Softer waters at the brewery sites, for example, favored the production of tasty German-style lagers. In sum, the specific composition of brewing waters differed from place to place and from time to time. The practical implication of these geographic and temporal differences necessitated water treatment to achieve a delicate, desired brew taste and the appropriate clarity expected of the final product.

A potable water source is therefore not necessarily and sufficiently *suitable* for a brewing a good German lager beer perceived by its consumers to have a great taste. The appropriate malts, hops and yeasts in complex proportions—the lager recipe—in addition to the local water ingredient are all part of the brewer's magic. The result is a consistently flavorful and popular lager beer. It is also the recipe for commercial success, locally, regionally, and, in the twenty-first century, nationally or even globally.

The Geo-Psychology of Water: A Beer Story

The geo-hydrological conditions for beer brewing comprised an essential preface to our brew culture story here; a story that focuses now the locations of selected Beer Belt breweries in order to feature popular brew water lore. This story can be concisely told as the *geo-psychology* of the water at the brew site.[5]

Although Figs. 9.1 and 9.2 might suggest so, hydro-geographical narrative of commercial beer brewing (or its geo-psychology) has never been strictly about the earth science of ground water. Pure H_2O is non-existent in nature. Water in the free environment always contains impurities. Water treatment has always been essential to the beer production process mainly for reasons of safety and taste. Today, water treatment at the brewery (filters, chemical additives, temperature controls) adds or subtracts from the compositions of brew waters that begin (as depicted in the illustration) as drops of rain. Between the cloud and the brewery, the raindrop becomes merged into surface waters, or ground waters that acquire more and more impurities during their diverse journeys to the urbanized breweries of the world. Imagine now Fig. 9.2 slightly modified to also depict human settlements with breweries upon the land surface. Ground water at the brewery site in a settlement the size of a city, be it London, Berlin, or Milwaukee, contributes a concentrated dosage of organic and other impurities to the ground waters beneath them and the surface waters near or within them. The journey of raindrop that arrives at a commercial big city brewery via groundwater must flow thorough a brownfield on its final approach to its brewer's intake pipe.

As an aside and to emphasize the importance of water quality, every geographer worthy of the profession has heard of the physician John Snow's map featuring the notorious Broad Street Pump in what is now Soho, London. Snow mapped the distribution of cholera deaths during a severe epidemic in London during 1854, discovering the source was a contaminated pump on Broad Street (now Broadwick Street). Some claim his map was the original GIS. Anyone who looks closely at the original map will notice a beer brewery located a stone's throw up the block. This was the Lion Brewery. Snow mentions there were seventy employees at the time of the cholera outbreak and no deaths among the brewery workers was observed. Their employer made them drink beer to quench their thirst on the job instead of their accessing ground water at the pump outside. Today, we note that beer -swilling geographers everywhere might well

[5] While under-utilized, the concept of "geo-psychology" is useful as it is inherently embedded within the everyday global economy and inherently explores the relationship between the environment and economics—and the derived socio-spatial perceptions associated with observed economic processes (or, as Keirsey (1997) argues, political processes, too) in place (see Gregor (1967).

GREEN • ALL-NATURAL • LEED CERTIFIED • EMPLOYEE OWNED • LOCAL • SUSTAINABLE • ORGANIC • 500 MILE DISTRIBUTION
brownfield
brewing company

Fig. 9.5 Brownfield Brewing Company, Indianapolis, Indiana

hoist a pint to the memory of John Snow at a pub across the street from the pump named in his honor.

While some regional craft brewers have embraced a double-reverse geo-psychological marketing strategy (see Figs. 9.5 and 9.6), most brewers have opted for the magical realism cooked up by the marketing divisions that inherently appeal to pristine waters; thereby ignoring that the complex taste of their beer inevitably retains traces of woodlots, agricultural fields, highway runoff, dairy pens, gardens, suburban barbeque ashes, graveyards and sanitary landfills among other ingredients.

Whether or not beer drinkers are aware of these histories (or flavor enhancements) depends on their individual environmental awareness, but it is important to realize that there was little the first commercial brewers in the Beer Belt could "do" about quality. Instead, early brewers simply chose to locate near potable springs and wells that were good matches for their specific recipes. For example, German-built Milwaukee breweries, like Schlitz and Blatz, selected locations where they could mass produce great lagers—mainly for Germans immigrants in settlements surrounding their breweries.[6] Early beers like Schlitz were dependent upon

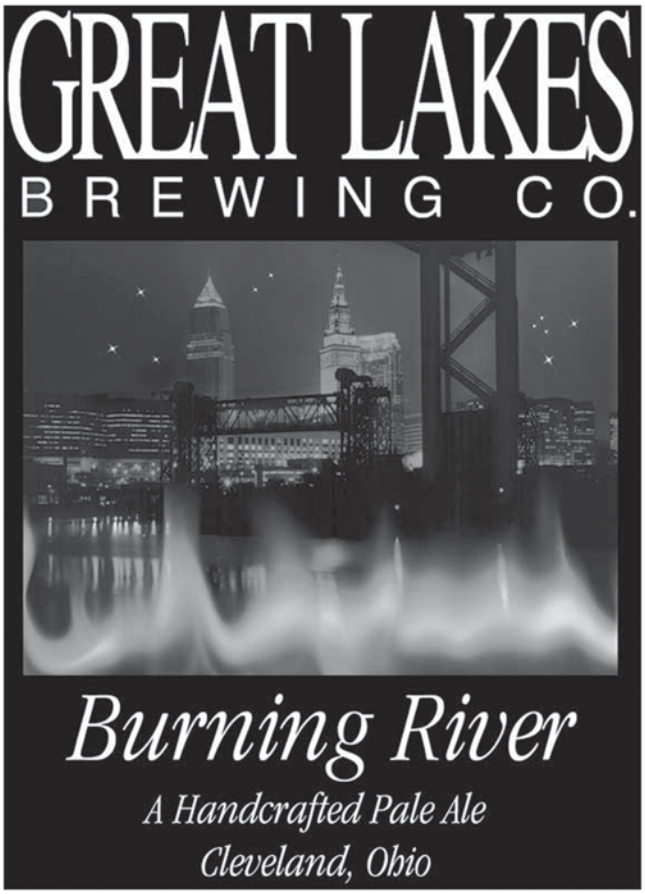

Fig. 9.6 Ironic label representation of the Cuyahoga River

abundant water resources to ensure consistency and maintain quality.

Was it Ever the Water?

Yes, it once was the water quality at the local breweries in the Beer Belt that explains their initial success—and that was a fact insofar as water quality was closely linked to definitions of potable. These days, however, it is water *lore* that successfully markets some—but not most—beers. It has always been the case in the history of Beer Belt brewing that the *best* product was the constant enemy of a *good* product. The geo-psychology in the brewshed of the local brewery was invariably that their *beer* was the best of all. The water ingredient of the brewery—most often the bounty of local springs or wells—was a big part of the rationale behind their truth claims and loyalty to the brew. But it was the same everywhere that good brews were produced. Local geo-psychology was that good beers *were* best beers. As the dialogue from the movie Deer *Hunter* (1978), which was set in southwestern Pennsylvania, underscores, the geo-psychology of a brewshed is powerful:

[6] In many respects, the historical settlement of German immigrants and the dominance of the "lager" style of beer in North America reinforced the perceived relationship between water, purity, and quality. While brewed locally by small firms, the visual clarity of the German lager style was consistent across the region. More recently though, regional craft markets have departed from the lager style associated with macro-breweries. The result has been to emphasize "difference", not "sameness" (i.e., market differentiation), vis-à-vis recipes and a shift away from a purer (and perceptually more water quality dependent) lager to more opaque pale ales, cloudy Belgians, as well as more exotic recipes.

Michael: *What kind of beer would you like?*
Linda: *What? I don't know. I don't care. Any kind.*
Michael: *I'll get you a Rolling Rock.*
Linda: *Okay.*
Michael: *It's a good beer, it's the best around.*

American "German" beer culture has been transformed by the geo-psychology savvy of postmodern beer advertising into a new "normal" beer culture, which is a popular, diversified beer culture where "anything goes." A popular regional brewery in an isolated South Pacific island named Palau Brewing Company brags that it exclusively uses rainwater in its brewing process. Meanwhile a new microbrewery in the Detroit suburbs uses local municipal water, and trusts the just-in-time delivery of its barley malt from Wisconsin, hops from Washington, and yeast from Chicago.

It's not the water…it's the story

Pristine waters are not the only strategy deployed by regional craft brews and the macrobrewers to add value in the marketplace. Indeed, the ironic juxtaposition of Great Lakes' Brewing Company's Burning River Pale Ale serves to effectively establish the brand as bold, audacious, urban, and decidedly Midwestern (Fig. 9.6). The brand builds on Ohio's rich heritage of German brewers and Cleveland's pop culture renaissance (think Rock-n-Roll Hall of Fame and Drew Cary's battle cry "Cleveland Rocks!") to create an urban brew of such quality that the water is irrelevant. Whereas most Americans recollect photos of the Cuyahoga River burning and the pollution plagued Lake Erie during the 1970s, the Great Lakes Brewing Co. makes water a non-issue. In doing so, they thereby suggest that the brewers (not nature) are responsible for a beer's taste and quality. In short it's the story surrounding the water that sells the beer and defines quality, not necessarily the water.[7]

Like Great Lakes' Burning River, a new start-up located in Washington, DC has upped the ante in the water arena. While very few brewers publicly admit to using local municipal water, DC Brau is actively using it as part of its marketing strategy (Sidman 2012). According to the Sidman (2012) article, "…when DC Brau founders Brandon Skall and Jeff Hancock opened the first brewery in the District in nearly 60 years, lots of folks told them they were crazy for making beer with D.C. water." "People have this idea of D.C. tap water, that it's disgusting or not fit for consumption, which is completely, completely false," Skall says. "We're not ashamed of using D.C. water. In fact, we're proud of it, and we're not afraid to say that." In many respects, the new geography of local beer echoes the growing local food movement and demonstrates how marketing and a local appeal may override negative place-based resource perceptions. Likewise, the new localized beer industry demonstrates an increasing disconnect between water and quality.

One of the first examples of mythmaking in the beer industry would be the Florida Brewing company's (1896–1961) explicit linkage between beer, health, and spirituality. Indeed, Wikipedia notes that the Florida Brewing Company (1896–1961) building is said to have been built on sacred space: "It was built on the Government Spring, which originally supplied water to the military men of Fort Brook. This spring was valued by many cultures to be sacred. Florida's Paleo Indians believed the water in the spring to be of a sacred nature. They brought their sick and wounded to bathe in the water with the belief that it would cure their injuries and diseases. Nearly every Indian tribe respected the spring's holiness and thus would use the land around the spring as a peace zone, where no one would attack. Influenced by these tales and others in Europe, Spanish Conquistadors fell under the belief that there were crystalline fountains of youth hidden in the springs. Juan Ponce de León helped spread these rumors when he and a Spanish Armada set out to find a mythical fountain of youth. Many still believe the spring to have supernatural powers." While Wikipedia may be an unorthodox academic resource, the website does reflect the public's perception of history, and in the case of beer, the passion associated with now defunct brands. As such, the FBC example underscores the inherent linkage between place, history, the environment, and the power of geo-psychology.

One argument against (or perhaps an argument that diminishes the importance of) water quality assumes brewing technology, geochemistry, and the master brewer's art have changed considerably since the 1800s. While local water quality may have been difficult to control historically, techniques exist to purify water and ensure taste and aroma. Indeed, the success of the macro-breweries demonstrates that the deployment of highly technical quality regimes can ensure global product consistency across multiple facilities, and underscores the importance science plays in the contemporary brewing process. While no doubt the industry was historically defined by basic human environment interactions, technology has changed the industry's dependence on physical geography.

Conclusion

In this paper, we examined the historical linkage between the location of U.S. breweries and water inputs; or what we have conceptualized as a "hydro-geography of beer." As we demonstrate, the linkage has changed over time not only as a result of technology and transportation improvements; but

[7]Great Lakes Brewing Company sponsors the annual Burning River Festival and underwrites numerous sustainability initiatives with an emphasis on water quality issues.

also the changing structure of the global industry. That is to say, the trend towards globalization has opened up new local and regional spaces and markets that have successfully reunited the relationship between water and quality in the geographical imagination of customers. In doing so, new regional markets demonstrate that firms deploy marketing techniques that elucidate a new geo-psychology of beer that is at times historic, ironic, and irreverent—but necessarily positioned in a "place-able" geography.

Acknowledgments Historical beer label images were obtained online at multiple sources and used in a fashion consistent with "fair use." When and where specific labels (excluding photographs by the authors) are presented in the text as individual images, permissions were obtained. As such, the label of Burning River Pale Ale is used with the permission of the Great Lakes Brewing Company. The Brownfield Brewing Company logo was downloaded from a Facebook wall associated with the firm and multiple documented efforts were made to contact the non-existent company, its now defunct website, and/or members of the former management team. The un-registered and unmarked logo is used within the context of fair use. Finally, the authors acknowledge the assistance of ISU Multimedia services and the Bellarmine University Public Affairs & Communications division with various images, notably Fig. 9.2.

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A Taste of Place: Environmental Geographies of the Classic Beer Styles

10

Stephen Yool and Andrew Comrie

Abstract

The environmental geographies of beer can be viewed as a coupling of Earth's elements (yeast; hops; malt; water) and brewing ingenuity. Yeast literally brings life to beer, contributing distinctive flavors and frothiness. Hops do best at cooler latitudes, and in wetter climates, where soils, day length, temperature, rainfall and terrain all influence regional hop characteristics. Brewing malts are cultivated, mostly, in a cool swath of countries just poleward of 45° north latitude. Mixtures of minerals found in local water supplies impart characteristic flavors and mouth feel to beers brewed there. The geographic combination of variations in yeast, hops, malt and water produce, we argue, a 'taste of the place' that one can term the 'terroir' of beer. Climate change could, however, modify beer terroir. A warming planet would alter the latitudinal range of future hop and malt cultivation, leading to changes in supplies, quality, and prices.

Introduction

Beer. Behind this single syllable—and behind the empirical formula for ethanol or drinking alcohol (C_2H_6O)—may lay the origins of human social systems. We hope our discussion supports the view, held widely, about the extent to which ethanol—and the yeast, hops, malt and water that define beer—have played a role in the unfolding of civilizations (Standage 2006; Tucker 2011). Some may detect in this chapter the spirit of Michael Jackson (1942–2007; the late British authority on beer). We used his taxonomy of the classic beer styles, and hope our readers consider this, as we do, a celebration of Mr. Jackson—an intellectual life force that helped catalyze in the 1970s a worldwide revival of interest in beer that continues today.

We assume that you are reading this chapter because you like beer and are curious about its geography. We interpret beer from the perspective of environmental geography, a subfield of geography that integrates science and society. Beer begins as a set of natural resources and becomes both a natural and social product through environmental, cultural and economic processes. Though we focus chiefly on the physical geographic environments that favor certain classic beer styles, we never stray too far from the idea that beer and people have together defined geographic space and place (Katz and Maytag 1991), and that we relate to beer in different ways: To a physical scientist, beer might be about the thin bead of rising bubbles that takes the mind to the physics of nucleation: upon opening a bottle, equilibrium is disrupted and bubbles grow due to the reduction of pressure (i.e., Boyle's Law) and the flow of CO_2 from solution into free gas bubbles (i.e., Diffusion). A poet or novelist might see in beer the literary furies. An historian might think about the origins of fermentation and when the first hops were cultivated. An archeologist might, at the end of a long day, stare into her glass of beer and recall that the Fertile Crescent likely had optimal conditions for grain cultivation, and that beer was a dietary staple with some of our earliest civilizations (Standage 2006). To an environmental geographer, beer might represent how society and nature interact over space.

And so this is where we launch this chapter, describing the environmental spaces of the elements that make beer special and spatial—a synthesis of science and society some believe has defined who we are. We describe how the Earth has given

S. Yool (✉) · A. Comrie
School of Geography and Development, University of Arizona,
P.O. Box 210076, Tucson, AZ 85721, USA
e-mail: yools@email.arizona.edu

A. Comrie
e-mail: comrie@arizona.edu

M. Patterson, N. Hoalst-Pullen (eds.), *The Geography of Beer*, DOI 10.1007/978-94-007-7787-3_10,
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Fig. 10.1 Geographic Origins of Classic European Beer Styles

birth to beer—with the help of human social systems and their chemical ingenuities; how the land produces the ingredients for the libation we savor. We present first a brief discussion on the macro- and microscales of beer. We follow with the 'anatomy' of beer, discussing the physical geography supporting the variability of yeast, hops, malting barley and water. We then launch into the geography of classic beer styles, touring through lambics, ales, porters, stouts and lagers.

We feature the final element of beer—the brewer—in discussions of beer terroir (i.e., the 'taste of the place'), presenting a case study of beer brewing in the Willamette Valley, Oregon. We conclude with the effects climate change may have on the brewing industry, then present last thoughts and recommendations.

The Geography of Beer: A Matter of Scale

The geography of beer is, for us, a 'scaled' discussion: There are the broad scale factors—variations in climate and in soils—that help us understand the diversity of hop acidity and malt sugars. And then there are the microscale factors, shedding light on the molecular structures that characterize different yeasts and brewing waters. We return to this concept throughout the chapter. Taking as a guide the geographic 'roots' of beer (Fig. 10.1) we describe next the anatomy of beer—the physical geography that supports spatial variability in yeast, hops, malt, and water.

Figure 10.1 shows the European geographic roots of beer (Adapted from Michael Jackson's *Beer Companion*, pp 12–13). Recent findings expand the geographic origins of European beers from Germany, to Portugal and Spain: Alcázar et al. (2012) selected chemical variables based on their importance in the brewing process as well as their use as quality indicators, showing the geographic parsing of beer origins into these three geographic origins.

The Anatomy of Beer

A deceptively simple anatomy characterizes beer: malt, water, hops, yeast, and brewer, as alchemist. Malting is the process of germinating the brewing grains, making their sugars soluble. The mash is the slurry of hot water and malt, which produces a sugary juice. This sugary juice is filtered out of

the spent malt, and hops are added, forming the wort. The wort is boiled along with the hops—during which process we can actually proclaim the beer is being 'brewed.' Finally, the yeast is 'pitched' into the cooled wort, launching the fermentation and aging processes that produce the final product. For completeness, we note certain beer styles contain "adjuncts" such as fruit, spices, rice or corn. Some Belgian beers add fruit and spices; German hefeweizens are brewed with wheat to alter flavor and aroma; and some mass-market beers use other grains (e.g., corn, rice)—chiefly as a way to increase fermentable sugars, therefore alcohol. Geographically speaking, beers based on malted barley and hops have their origins in Western Europe, but there are many types of beer based on fermented grains developed by cultures elsewhere. Although the malt beers are now known around the world as "beer," beer made from millet, rye, sorghum, and other grains in Africa and Asia are just as legitimately termed "beer". Even mead, made from honey, is technically a kind of beer. For the reader interested in other forms of beer, historic and modern, see the chapters by Sewell, Nelson, and Mittag in this volume.

Beer is the world's most widely consumed alcoholic product. Following water and tea, beer is the third-most popular drink overall and considered by some the world's oldest fermented beverage (Nelson 2005). Zymurgy is the branch of chemistry that deals with fermentation processes (www.thefreedictionary.com/zymurgy). Beer integrates the subtleties of flavor and mouth feel contributed by its anatomical parts. Stated differently, zymurgy is synergy: A 'whole' glass of beer is greater than the sum of its parts. For a thorough introduction to the brewing process, the interested reader is directed to Lewis and Young (2002), Noonan (2003), and Priest and Stewart (2006).

Yeast: Earth's Archetypal Cosmopolitan Organism

Yeast works at the microscale; it is the only living part of beer. Yeasts are everywhere—air, soil, plants and animals, and even the deep sea—and thus are a good example, in biogeography, of a 'cosmopolitan' organism (i.e., an organism that is very common in the environment). Among the oldest domesticated organisms, yeast is distinctive because it was not part of the original German Beer Purity Law, known also as the Bavarian Beer Purity Law (Reinheitsgebot 1516). In its place now sits the Provisional Beer Purity Law, which permits additives forbidden in the Reinheitsgebot (e.g., yeast; wheat malt; cane sugar). It seems likely the Reinheitsgebot was conceived in partial ignorance: it would be another three centuries before Louis Pasteur (1822–1895) discovered the role of yeast in fermentation.

Ancient brews relied on spontaneous fermentation by airborne yeasts. Some beers still get their distinctive flavors from wild yeasts that fly into the wort from the odd open window: Fruity lambic beers from Belgium are brewed in open vats that rely on spontaneous fermentation. Southwest of Brussels, for example, in the small town of Vlezenbeek, the Lindemans brewery has been selling their lambics commercially since 1822. Other lambic producers include but are not restricted to Boon, Girardin, De Keersmaeker, De Neve, De Troch, Timmermans, vander Linden and Vandervelden.

Beer yeasts are either top fermenting (ales) or bottom fermenting (lagers). We can attribute the first observations of yeast cells to the microscopy of Leeuwenhoek (1632–1723), and descriptions of the fermentation process to the chemist Lavoisier (1743–1794) and the microbiologist Pasteur (1822–1895). The process of fermentation, once mysterious, is now the well-characterized conversion of sugar to alcohol and carbon dioxide (Priest and Stewart 2006). Most brewing yeasts are today nurtured and monitored in modern biochemical 'wet' labs, to insure the consistency of the beer these yeasts make. For a recent, scientific discussion of yeast genetics and the fermentation process, the curious reader is directed to Hornsey (2012). For an academic curriculum on beer and the brewing process, we suggest following the work of University of California, Davis Professor Emeritus of Brewing Science Michael Lewis (http://extension.ucdavis.edu/unit/brewing/about.asp).

The genetics of the yeast *Saccharomyces cerevisiae* have produced a continuous flow of research. Examining genetic diversity worldwide in about 650 yeast strains from over 50 geographic regions, for example, investigators defined the genetic sequence for yeasts at 12 microsatellite loci (Legras et al. 2007). They found 575 genotypes (i.e., distinctive genetic makeups) organized in subgroups of yeast types (i.e. bread; beer; wine; sake) Investigators noted that up to 28% of genetic diversity between these groups was associated with geographical differences, suggesting local domestication(Legras et al. 2007). We believe however that yeast changes on very rapid time scales, thus would be hard pressed to make a map of distinctive yeast regions. So we take a less geographic path, for the moment, to the two major classes of brewing yeast.

Ale Yeasts

The ale yeast *S.cerevisiae* works at relatively warm temperatures, implying that ales dominated beer before the advent of refrigeration (Jackson 1993). The 'top' fermentation of ales consists of primary and secondary phases: Primary fermentation is very active, running about a week and producing a frothy cap of yeast cells. Such vigorous fermentation increases temperatures in the beer column from around 15 C to around 25 C. (Some home brewers who have fermented their 'primary' in glass containers have doubtless marveled, as we have, at the lively roiling inside; the glass feels warm to the touch as the carbon dioxide by-product rises through

the column of wort, escaping through a stoppered airlock out the top of the bottle neck.) Ale brewers skim off the yeast after a week or so, enabling flavors to evolve during another week or two of secondary fermentation. Another reason to skim is that all yeasts mutate, and could co-mingle with wild yeasts with unpredictable results. Brewers may, after secondary fermentation, add sugar and re-inoculate the brew with fresh yeast for natural carbonation.

Lager Yeasts

Lager yeasts are now the most widespread form of beer yeast in terms of sheer volume because of the worldwide popularity (and similar taste) of mass-market lager beers in almost every country. Lager yeasts are bottom-fermenting, cryotolerant hybrid yeasts: *S. cerevisiae* contributes to the formation of hybrids—combinations of *S. cerevisiae*, *S. uvarum* and *S.eubayanus*. We note the hybrid now identified with lagers is *S. pastorianus*—a co-mingling of *S. cerevisiae* and *S. eubayanus*. The ubiquitous image of a chilled lager beer to quench a thirst has its roots in the makeup of lager yeast. It is no accident that ale yeasts do their best 'magic' at temperatures typical of European brewing cellars in the summertime, and that lager yeasts likewise are most effective at lower temperatures typical of those same cellars in the winter (when protected from the elements). The distinctive character of lager beers as clear, crisp and generally lighter than ales is related directly to the ability of lager yeasts to ferment in cooler conditions. A special use of lager yeast is in the brewing of 'steam' beers, produced by fermenting these yeasts at ale yeast temperatures. We turn now to the intriguing and controversial geographic origin of lager yeast.

Lager Yeast Mystery Solved?

Scientists and brewers long recognized that lager yeast was, among about 1,000 species of known yeasts, a mysterious hybrid. But U.S. scientists have discovered the geographic origins of the yeast strain that gave the world lager beer. Dubbed *Saccharomyces eubayanus*, the yeast was discovered in galls that infect beech trees (Fig. 10.2). Geneticists readily sequenced the yeast, reporting it was 99.5 % identical to the non-ale yeast portion of the lager genome (Libkind et al. 2011).

Investigators speculated that *S. eubayanus* 'stowed away' some 500 years ago in the Age of Exploration traveling some 7,000 miles from the beech forests of Patagonia (the alpine region of southern South America), to the cool Bavarian caves and monastery cellars where European brewers stored their beer. We note however that renowned archeologist Patrick McGovern questioned this exceptional journey: Dr. McGovern is a recognized expert on the history of alcoholic beverages and Director of the Biomolecular Archaeology Laboratory at the University of Pennsylvania Museum. McGovern believes it is more likely that galls

Fig. 10.2 Sugar-filled galls on a southern beech tree (*Nothofagus pumilio*) in Patagonia, South America. Galls are the beech's immune response to invasion by a fungus. C.T. a scientist on the project reported to Science News that "Beech galls are very rich in simple sugars. It's a sugar-rich habitat that yeast seem to love," (Roach 2011). Image Credit: Diego Libkind

in the oak forests of southern Germany also hosted *S. eubayanus*, at least until it was excluded competitively by the ubiquitous *S. cerevisiae*. He speculated that use of European yeast-bearing oak for beer barrels and processing vats was a strong alternative explanation for how a yeast species turned up in Bavaria that made tastier lagers by enabling cold fermentation (Roach 2011). But did European forests actually host *S. eubayanus*? Libkind and colleagues showed that the contaminant strain *S. bayanus* found in the European brewing environment is not its own species. It is actually a domesticated hybrid strain of *S. eubayanus* (The "eu" part of "eubayanus" signifies that the Patagonian strain is the pure progenitor species). Interested readers may wish to know more about Dr. McGovern, who has through analysis of the relict chemicals in ancient pottery shards reproduced one of society's earliest 'paleobrews' (Tucker 2011).

Hops (*Humulus lupulus* L.)

Hops are the small flower-like cones of the hop vine, with dozens of hop varieties belonging to the same basic species, *Humulus lupulus* L. Hops contain bitter resins that are released during the brewing process, thus providing bitter counterbalance to the otherwise sweet taste of the wort and to that of the finished beer. Hops give beer its flavor, aroma, and serve as a preservative. Hops were used, for example, to preserve beers shipped to India from England during the height of the British Empire. The India Pale Ale is, thus, a distinctively bitter style. See Haugland's chapter in this volume for a more detailed narrative on IPAs.

Table 10.1 Mineral content (ppm) in the water of select beers. (Source: http://www.cs.cmu.edu/afs/cs.cmu.edu/user/wsawdon/www/water.html.)

	Pilsen	Pittsburgh	Munich	Vienna	Burton-on-Trent
Calcium (Ca^{++})	7	32	75	200	270
Magnesium (Mg^{++})	2	6	18	60	60
Sodium (Na^{++})		2	2	2	8
Carbonate ($HCO3^{-}$)	15	45	150	125	200
Sulfate ($SO4^{-}$)	5	72	10	120	640
Chloride (Cl^{-})	5	31	2	12	40
Total dissolved solids	35	179	275	850	1,200

All values are parts per million. Pittsburgh data are from 1992 City of Pittsburgh Water Analysis. Pilsen, Munich, Vienna data are from New Brewing Lager Beer by Noonan (2003). Burton-on-Trent data are from Pale Ale by Foster (1999).

Hops respond to macro-scale environmental cues: The comfortable geographic range for growing *H. lupulus* L. is about 35–55° north latitude—running from western Europe east to Siberia, Japan and North America (except for mountains and deserts). Hops are cultivated also between 25 and 45° south latitude. Although hops have been grown with some success in Australia and New Zealand (Small 1980; DeLyser and Kasper 1994), we comment on hop growing seasons in terms of their native northern hemispheric roots.

Hops need direct sun and around 15 h of daylight for 120 days. Hop vines grow quickly in spring and summer when irrigated artificially or by spring rains, twisting around and clinging to vertical poles with their hooked hairs. Vines reach 5–8 m by the end of June, when decreasing daylength cues cone production. Hop plants can be male or female, and it is the female plants that produce the resinous cones. The male plant serves as a pollenizer, but is not essential for the female to bear cones. Hops thrive in deep, well-drained sandy loam soils, climbing skyward from rhizomes and true roots that penetrate soils to around 5 m (http://www.oregonhops.org/culture2.html). Hops suffer from a variety of diseases. We discovered in our travels to the Willamette Valley, Oregon that the downy mildew fungus, for example, poses a significant threat to hop health: Downy mildew thrives in wet conditions, and can halt hop cone production. Hop shoots infected by the fungus are stunted and brittle.

Barley Malt

The best malting barleys for beer have plump, fine-skinned kernels, are rich in starch, with low protein content. There are two varieties of malting barley, distinguished by the number of rows of grain in each ear: Two-row barleys contribute soft, sweet flavors preferred by lager brewers. Six-row barleys have a firmer, crisper, structure, which is prized by some ale brewers. Malting barleys vary at the macro scale, faring particularly well in cool and semi-arid climates, and favoring loamy soils with a pH of 6.5–7.5. Winter barley tends to be husky. Spring barley is softer and sweeter. The barley grain is 'malted' to make it soluble—a process of soaking, sprouting and drying. When the grain (a seed) begins to sprout, this process produces enzymes that break the carbohydrate molecules (starch) in the grain into shorter molecules and sugars that can be dissolved and fermented into alcohol, something that cannot be done as easily or effectively with the plain starch alone. The sprouted and dried barley is often simply termed "malt."

Malting barleys map across the broad geographic scales defined by climate and soils. Highest quality malting barleys are grown chiefly in the northern hemisphere, in a distinct swath of countries just north of 45° latitude. Renowned growing regions in the northern hemisphere include Moravia and Bohemia in the Czech Republic; the Munich Basin of Bavaria, Germany; Denmark; the English regions of Wessex, East Anglia and the Vale of York; the Scottish Borders and the Moray Firth; the American Midwestern states (notably North Dakota) and the Pacific northwest; as well as Saskatchewan and Alberta in Canada. Similar southerly latitudes cultivate malting barley, although on a smaller geographic scale: Barley-growing regions in the southern hemisphere include the Australian states of Victoria and South Australia; the southernmost part of New Zealand; Western Cape Province, South Africa; and a zone across South America, from Uruguay to Peru and Ecuador. Just as different regions of the world promote their own wine terroir, so too are there discussions among brewers about the distinctions of "continental" barleys, such as those grown in Bavaria vs. the "maritime" grains of Denmark or the UK. Continental barleys are said to provide a sweet, nutty flavor, while maritime malts offer a clean, sea-breeze character.

Water

Beer is more than 90 % water. The character of the water can affect the flavor of the beer significantly, and several beers are marked by their historic use of the local water, such as the ales from Burton-on-Trent in England—a major brewing center a century ago. We first look at the finest scale, describing the role of minerals in beer. We turn then to the macro scale, describing the geographic distribution of water hardness and its potential contribution to regional distinctions among beers (Table 10.1).

Calcium is the dominant mineral of water hardness and is, in proper amounts, advantageous to the brew: Calcium is a catalyst for enzyme activity and facilitates protein assimilation. Calcium also brings out subtle bittering flavors from the hops and supports the clarity, stability, and flavor

of beer. Magnesium and Sodium can in small amounts enhance a beer's flavor. Carbonates neutralize mash acidity, but can in excess impart bitter flavors, especially to subtle lagers. Sulfate gives beer a dry, fuller flavor, adding sharpness. Chloride amplifies bitterness and improves clarity. It lends a salty taste to beer, and generally enhances beer flavor and full 'mouthfeel.'

The classic beer styles can be attributed in part to the original water chemistries of the locations in which they were developed. Certain geographic regions are thus noteworthy for their classic beer styles as defined by the waters available for brewing (Goldammer 2000). Calcium sulfate in the brewing waters from wells at Burton-Upon-Trent (England) is thought, for example, to contribute the distinctive character of pale ales—a dryness, firmness of body and lingering finish associated with this style (Jackson 1993). Munich water is, by contrast, low in sulfates and chloride but contains carbonates—a cocktail of minerals well-suited to dark, smooth lagers (Goldammer 2000). Breweries are however turning increasingly to public taps: wells and springs are unreliable or polluted; and minerals can to a limited extent be added to control chemical consistencies.

A Geographic Tour of Classic Beer Styles

Beer is brewed on virtually every continent of the planet; however, all classic beer styles (as defined earlier in this chapter originated in Europe—more specifically, in the northern part of central and western Europe (Jackson 1993). We describe below the essential characteristics of the classic beer styles, including qualitative aspects that tie taste to place. This is terroir—the idea that distinctions among different beers derive in part from their distinctive geographic origins (see next section).

Lambic and Wheat (White) Beers

Lambics hail, it is thought, from the village of Lembeek in Payottenland, the geographic heart of lambic beer country. Lambics are brewed from a grist of at least 30% unmalted wheat and fermented spontaneously with whatever yeasts remain in the barrel or settle out of air column. Lambics are thus one of a kind, served up from casks, and their flavors can evolve on daily timescales. Many lambics hail from the Senne River valley. The Senne flows through Brussels, wherein are found small hills studded with cherry trees and a mild climate supporting airborne yeasts that have inoculated farm breweries there for over five centuries. The lambic form is nearly flat and tart—with flavors poised between sherry and cider (Jackson 1993); Fruit flavors and carbonation can be added, in which case the original lambic is transmogrified into a fruit beer.

Belgian wheat (white) beers are top-fermenting, thirst-quenching brews crafted typically with raw unmalted wheat, giving these 'whites' a characteristic haze (from wheat proteins and special yeast), a whitish fermenting foam, and light hues in the glass. The sparkling character of wheat beers from Berlin are said to have prompted Napoleon's troops to wax effusive about this 'champagne of the north.' The wheat beers of Bavaria are light, spicy, similarly sparkling brews that one finds on the summer tables in southern Germany—but this refreshing style is also enjoyed worldwide.

Ales

Ales are produced via warm fermentation, with strains that rise to the top of the brewing vessel. The term 'ale' refers specifically to the mode of fermentation, thus is exclusive of malts, hops, color and strength. Ales typically have a comparatively rapid fermentation cycle, imparting a sweet, full bodied, fruity character. Most ales are hopped, preserving the beer and giving ale its bitter herbal overtones that balance the sweetness contributed by the malt.

British Ales: The term 'ale' appears most associated with the British Isles. Ireland and Scotland each have their own unique ales. The English ales varieties are mild, bitter, pale ale, India pale ale, brown ale, old ale, and barley wine. The kegs of 'milds' for example were kept full for the harvest workers. A British 'mild' is typically light in body and low in alcohol. With hints of sweetness, 'milds' were restorative brews—a reward after a day working the fields around Birmingham, Walsall, Wolverhampton or Dudley.

Belgian Ales: Belgium produces a wide variety of specialty ales that resist rapid definition. Duvel is a classic Belgian golden ale: strong, ripe with fruitiness, aromatic, full of hoppiness, and displays an inviting 'rocky' white head in the glass. A handful of Belgian breweries are, intriguingly, associated with Trappist monasteries. Trappist brewing appears to have both geographic and religious origins: Brewing by some Trappist orders was consistent with their 'godly' credo of living off their own land, labor and resources. Most Trappist and Abbey beers have high alcoholic content, yet are light in body due to the addition of large amounts of sugar. Trappist beers are brewed under direct control of the monks themselves. There are over 150 Trappist monasteries throughout the world; only a handful of these brew beer, and most are in Belgium. Abbey beer is brewed by commercial breweries in the style of a Trappist beer. All Trappist beers are bottle-conditioned—inoculated with yeast. Orval for example presents a cloudy brass/orange hue, leaving intricate patterns of white lacy foam on the glass. The Orval nose is 'bready' with the fragrance of resident yeast, and the bright, fizzy liquid is a composite of lemons, nutmeg, cloves and anise.

Porters and Stouts

Stouts were traditionally the generic term for the strongest or 'stoutest' porters in terms of alcohol content (7–8 %). Originating in London and Ireland, the stoutest porters just became stouts—a style in their own right. Most stouts are dark, acquiring their rich, tawny hues from dark-roasted malts. Classic porters and stouts are crafted using top-fermenting yeasts, which contribute notes of fruitiness that balance 'roasty' flavors (Jackson 1993). We can identify some geographic characteristics and tastes of porters and stouts: The porters of Estonia have 'toffee' flavors; the brews of northern France tend to be heavy on malt. The stouts of England and Scotland are sweet; and Irish stouts brewed by Guinness, Murphy or Beamishare are characteristically dry. An imperial Russian stout will satisfy those with a tongue for a dense, dry, dark full-flavored brew.

Lagers

Lagers were first brewed by fifteenth century Bavarians and are now arguably the most popular alcoholic beverage in the world. Lagers are 'laid down' for aging, at around 0 °C, for as long as nine months for strong lagers, and less than a month for light lagers. Lager yeasts typically impart a distinctively clean, smooth taste, and usually lack the complexity tasted in ales. Some of the best dark lagers have a spicy maltiness, between sweet and dry, while ever clean and round due to the cool fermentation of lager yeast.

There is an interesting geography behind what lager means in different countries: While consumers in the Austria, the Czech Republic, and Switzerland typically use the term 'lager,' Germans use 'helles' (i.e., 'bright') or'dunkles' (i.e., 'dark') or even 'schwarz' (i.e., 'black') to identify their lagers. Perhaps the Germans discriminate because of their own history—acknowledging that dark lagers predate light lagers. It is thus not surprising that dunkles is a dark lager of long-standing tradition in Munich. Bamberg, Bayreuth, Kulmbach and Lichtenfels remain the German heartland of dark lagers (Jackson 1993).

A Taste of Place: The Terroir of Beer

Should the term 'terroir'(i.e., the 'taste of the place') be reserved to wine only? Wines are viewed geographically as place-based—a synthesis of the 'personality' based on the grapes' distinct growing locations, thereby giving a wine its terroir. Different wine grapes prefer different climates: different grapes thrive in different microclimates, spanning many degrees of latitude. Although every step of the journey from grapes to wine is monitored closely by winemakers, there is no doubt climate and soils influence the raw materials.

The contemporary brewing practice is perhaps as exacting as wine production; thus one can argue (as we will here) that there is potential for a "beer terroir." Malting barley and hops thrive in the cooler latitudes. Soil differences produce place-based variations in hop flavors. Some brewers claim furthermore that wild regional yeasts contribute distinctive flavors. The Monks at Brasserie d'Orval know all too well from their followers that scrubbing out the 'seasoned' crust within their brewing kettles changes the subtle characteristics found in their famed Trappist ale. Noted journalist, author and homebrewer Stan Hieronymus tells the story about the terroir of brewing water: When construction at Abbaye Notre-Dame de Scourmont in south Belgium limited production of its Chimay Blanche, they contracted with Dutch abbey Konigshoeven to brew the Blanche. To insure the distinctive quality of the Blanche, however, Abbaye Notre-Dame de Scourmont trucked their local water to Konigshoeven.

If we moreover examine hops—the aromas, the flavors and the bitterness appear to have distinctive geographic origins: The world's chief hop growing regions are found in Germany, Belgium, the Czech Republic, Kent and Worcestershire in the United Kingdom, and the Yakima and Willamette Valleys in the northwestern United States. The amount of intercepted solar radiation and soil chemistry are key to the successful cultivation of hops. The Anheuser-Busch Elk Mountain Hop Farm in Northern Idaho, for example, is located in a climate that emulates the Hallertau region of Bavaria. Spatial variations in soil, day length, temperatures, amount of rainfall and terrain all may, in sum, influence regional hop characteristics.

Let's take Oregon, for example: When its hops are harvested, Deschutes Brewery rushes them back from the fields fresh, not dried—and the resulting beer tastes, they say, of Oregon itself. It thus rings true that "… the taste of place exists, as long as it matters." (Trubek 2009). And for a look at terroir in the southern hemisphere, Coopers Brewery (South Australia) cultivates local varieties of two-row barley. Produced in fields close to the sea, Coopers converts the grain into pale, crystal and roasted malts that impart the maritime 'sea breeze' flavors devotees find in their pints of Coopers Sparkling Ale (Jackson 1993).

We observe finally that the terroir of beer might be viewed also through the lens of cultural geography: Microbreweries are one example of a self-conscious reassertion of the distinctively local (Flack 1997): The neolocalism of microbreweries is a genuine attempt to produce a sense of place from beer. The Weeping Radish Brewery and Restaurant (Manteo, North Carolina) has for example poured its own lager since 1986—in the same place where the original settlers of the Lost Colony may have brewed the first beer in the New World. Consumers soon discover that they cannot get a Black Radish Dark Lager anywhere else on the planet (Flack 1997). The question of whether beer has the strong terroir

Fig. 10.3 Co-author Yool prepares to taste the flight of brews offered at Seven Brides Brewery in Silverton, OR. Image credit: Eugenie Rashwan

is an interesting one, requiring we suggest more geographic data collection, hence the following case study.

A Case Study of Terroir: The Beers of the Willamette Valley

Author Scott Burns described in his chapter in The Geography of Wine (Dougherty 2012) how the variability in microclimate and soils in the Willamette Valley, Oregon represented distinctive terroirs for the region and exemplified wine terroir in general. We return in this chapter to the Willamette Valley, visiting independent and corporate breweries in Silverton, Oregon to sample the terroirs of beer. Jeff DeSantis is owner-brewer at Seven Brides Brewery (independent); and Jennifer Kent is brewer at Thompson Brewery and Public House (one of a chain of McMenamin breweries). Both breweries use local malt, hops and ship in liquid yeasts. Seven Brides brewery uses Willamette, Hallertau, Perles, Fuggles and other hops grown within 3 miles of the Brewery—and we learned from DeSantis that Willamette soils produce hops with distinctive flavors and acids compared to their European counterparts (Figs. 10.3 and 10.4). Great Western Malting Co. (Vancouver, WA) supplies most of the brewing malts for the Pacific Northwest and other regions. Both Kent and DeSantis brimmed with enthusiasm as they discussed the art and science of brewing. Jeff DeSantis characterized Seven Brides as a brewing 'laboratory' with exacting standards and consistent quality. Jennifer Kent described Thompson's brewery as a 'kitchen' that produced 'signature' brews served at all the McMenamin properties (www.mcmenamins.com)—but added hastily that she appreciates the latitude McMenamin gives its brewers to 'think outside the box' and pour their personal recipes alongside its signature brews. Kent mentioned also that Oregon has the largest percentage of female brewers in the U.S.

Both brewers spoke quite reverently about their brewing water, drawn from public supplies: Kent for example observed that the McMenamin Hammerhead Ale—a signature brew in the McMeniman's fleet—actually varied from Silverton to Portland because of the difference in brewing waters. DeSantis also hailed the distinctiveness of the local water, supporting further the claim for beer terroir. But while we can cite anecdotal evidence of the importance of water and other key elements in support of beer terroir, the consistency and quality of beer's key elements may be affected by increasing variability in precipitation and temperature from changing regional climates.

A Glimpse into the future: Will Climate Change Change Beer?

It is likely that climate change will affect beer quality. Limited studies show that increasing air temperatures and rainfall variability in some regions will change the geographies of malting barley and hops. Air temperature and rainfall contributed the largest component of the variation in both β-glucan and protein content in malting barleys examined in China. Beta glucans (β-glucans) are the soluble dietary fiber component of malting barley. High levels of β-glucan produce thick, sticky worts that can cause problems with filtration and yield murky brews. Lower levels of β-glucan are thus preferred for brewing. Results from a regression model relating temperature and rainfall, protein content, and days from heading to maturity, suggest all these variables affected β-glucan content significantly (Zhang et al. 2001).

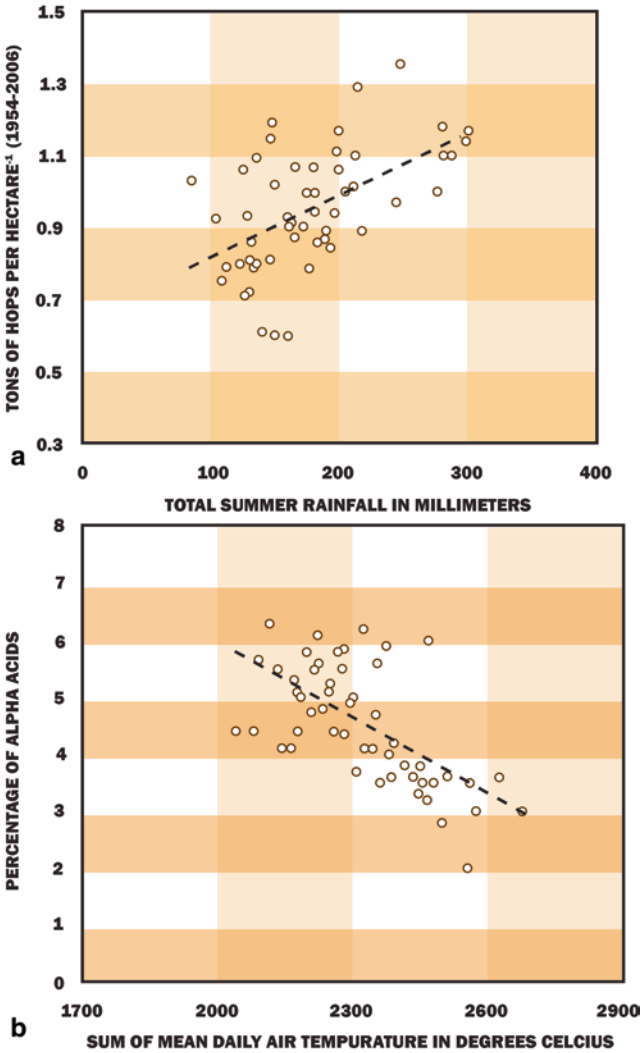

Fig. 10.4 **a** The relationship between the summer rainfall total (June–August) and the yield of Saaz hops for the period 1954–2006. **b** The relationship between the sum of mean daily air temperature for April–August and content of alpha-acids of Saaz hops for the period 1954–2006. (Source: Mozny et al. 2009)

Limited studies suggest hops will also be susceptible to temperature and rainfall variations: Brewers using Saaz hops that make pilsner famous have seen decreases in yield and quality associated with decreasing precipitation and increasing air temperatures. Even with the modest warming seen so far, hop yields and quality have decreased (Fig. 10.4a, b). Empirical data show increased air temperatures induce earlier onset of the hop growing season. Simulations forecast a decline of 7–10% in yields and 13–32% decrease in alpha-acid (Mozny et al. 2009).Climate change may therefore lead gradually to poleward shifts and compression of hop-growing regions, with uncertain consequences for availability, prices and quality.

Summary and Conclusions

Beer is a world-class brew; it is the third most popular beverage, after water and tea. There are five parts to this globally-prominent drink: Yeast, hops, malt, water, and brewer. The origins of beer can be traced back to the fifth millennium B.C. The classic beer styles we know today originated in northern Europe, where loamy soils and a cool climate favored the propagation of hops and malt. Yeast is the only living part of beer, contributing distinctive flavors to the classic beer styles. Used for baking and beermaking, *Saccharomyces cerevisiae* is the most ubiquitous of beer yeasts. Top-fermenting ale yeasts work at relatively warm temperatures and produce beers with a broad palate of fresh flavors. Bottom-fermenting lager yeasts work at comparatively cooler temperatures that produce thirst-quenching brews, making lager beer the most popular beer among consumers.

Best malting barleys are cultivated in a geographic ‘band’ of countries just north of 45° latitude. Renowned malt regions thus are limited to the cooler latitudes, Bohemia in the Czech Republic, parts of Germany and Denmark; the cooler regions of England and Scotland, then across the American Midwestern states, Pacific northwest, Saskatchewan and Alberta in Canada. Hops are, similarly, cool latitude crops. Variations in soil, day length, temperatures, amount of rainfall and terrain influence regional hop characteristics. The bitterness found in hops offsets the sweetness contributed by malt, lending beer nuanced flavors, aromas, and preservative qualities.

Beer is more than 90% water, thus water can and does affect the flavor of the beer significantly, contributing to beer terroir. Although water chemistry can be manipulated to regulate pH and other characteristics, we learned from modern brewers that water qualities changed the taste and mouthfeel of beer brewed to the same recipe. Beers sampled in the Willamette Valley, Oregon, confirmed anecdotally the importance of water and hops, strengthening claims for the terroir of beer.

Earth’s climate is changing, and this has implications for the quality of beer. A warming planet would shift hop and malt cultivation, reducing supplies, quality, and increasing price. Because beer is so popular worldwide and an integral part of our global culture, it might be said that the impacts of climate change will in this context be felt quite personally.

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Sustainability Trends in the Regional Craft Beer Industry

11

Nancy Hoalst-Pullen, Mark W. Patterson,
Rebecca Anna Mattord and Michael D. Vest

Abstract

Intensive water and energy use, copious volumes of wastewater and solid waste, and large carbon footprints make the process of brewing and distributing beer a not-so-(environmentally)-friendly industry. However, the rise of craft breweries and their perceived foci on environmental, economic and/or social sustainability trends have promulgated a "greening" in the beer industry at local to global scales. To assess the geographies of sustainability in the craft beer industry, we distributed a mixed method survey to all regional craft breweries in the United States. Overall, more sustainable practices have been adopted at various levels of the craft beer production, including the reduction of water and energy use and increased energy efficiency, the use of organic or local ingredients, and the incorporation of a culture that promotes sustainability. These and related findings showcase certain sustainability trends and practices being adopted by regional craft breweries in the United States.

Introduction

When we try to pick out anything by itself, we find it hitched to everything else in the Universe—John Muir 1911

Beer is a deceptively simple product with a simple core recipe: water, malt (cereal grains), yeast, and (more common than not) hops. And yet with these few ingredients (and sometimes a few additional adjuncts), the brewing industry has grown to become a global multi-billion dollar enterprise with a burgeoning craft beer market that produces hundreds of beer styles and varieties for the masses. In the United States alone, the $ 99 billion beer industry[1] constituted over 200 million US barrels[2] distributed in 2012 (Brewers Association 2013). However, these high numbers come with a cost—a brewing process that is water and energy intensive, and produces (in addition to beer) air, water and solid wastes. Many beer brewers—from local microbrews to corporate entities—are incorporating sustainability into their production of beer, for environmental, economic, and social reasons. In particular, the craft beer industry posits sustainability as inherent in the sourcing (ingredient origins), production, and/or distribution of beer. To this end, this chapter examines the three pillars of sustainability (environmental, economic, and social sustainability) by using the aforementioned three metrics (sourcing, production, and distribution) as it pertains to regional craft breweries in the United States.

The Production of Beer

Beer production is a multi-step process that includes three predominant stages—brewing, fermentation and process-

N. Hoalst-Pullen (✉) · M. W. Patterson · R. A. Mattord · M. D. Vest
Department of Geography and Anthropology, Kennesaw State University, 1000 Chastain Road, Kennesaw, GA 30144, USA
e-mail: npullen@kennesaw.edu

M. W. Patterson
e-mail: mpatters@kennesaw.edu

R. A. Mattord
e-mail: rmattord@gmail.com

M. D. Vest
e-mail: michaeldvest@gmail.com

[1] The total economic impact of beer is far greater, at approximately 246 billion $ (Beer Institute 2012).

[2] One US barrel = 31 gallons = 119 L = about 330 twelve ounce beers

M. Patterson, N. Hoalst-Pullen (eds.), *The Geography of Beer*, DOI 10.1007/978-94-007-7787-3_11,
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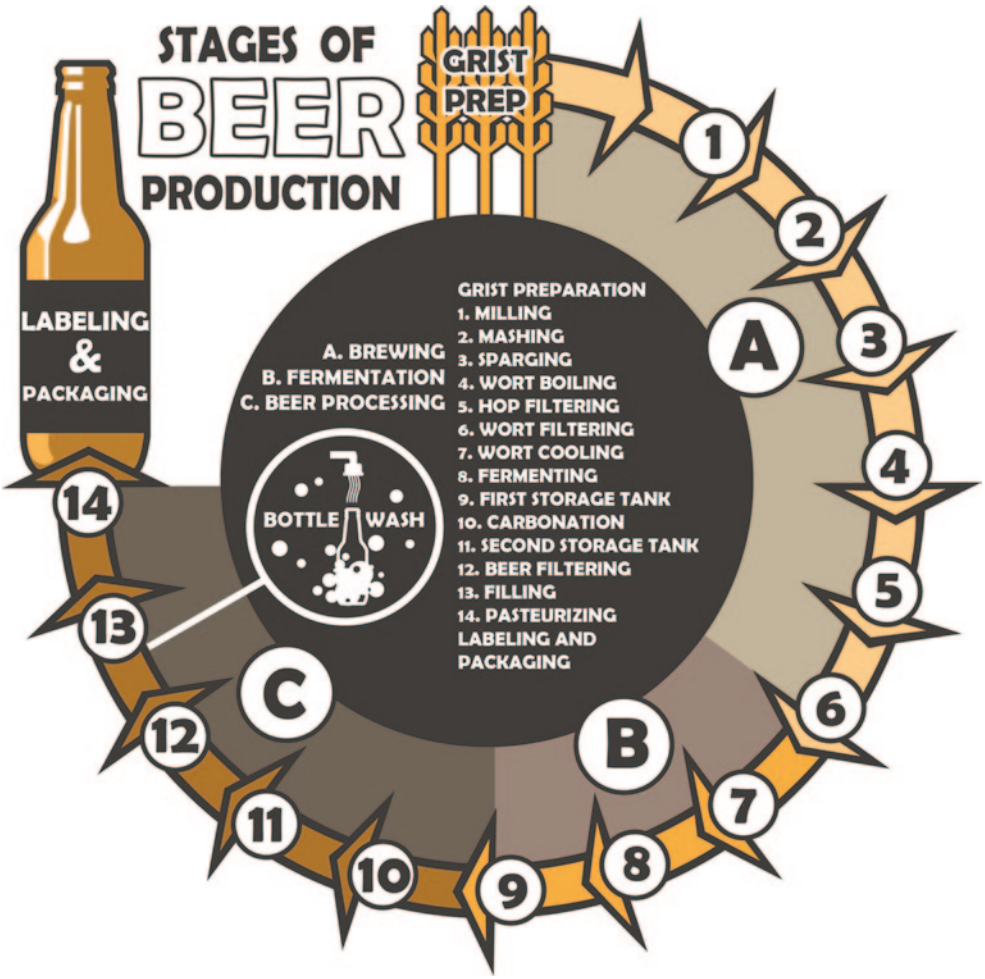

Fig. 11.1 Stages of beer production. (After Olajire 2012)

ing (Fig. 11.1). In the brewing stage, cereal grains (most commonly barley) are milled (and often conditioned) into coarse grist that is combined with hot (or heated) water to form mash. Sparging then occurs in the lauter tun by adding water through the mash to extract the wort (the liquid sugar extract) from the grain.[3] The wort is then boiled and hops added during boiling (bittering hops for bitter) and/or at the end (finishing hops for aroma). After boiling, the trub (a slurry of hops and sediment e.g. heavy fats, proteins, and dependent on the stage of the brewing process, inactive yeast) settles from the wort and is removed. The wort is then cooled and yeast (commonly as liquid slurry) and water are added and the process of fermentation occurs (at higher temperatures for ales compared to lagers). After fermentation, the beer is chilled and stored to allow for settling; the length of this conditioning time is dependent on the beer type (ale versus lager) and style. While carbonation results from the first fermentation, carbonation also can be added to conditioning tanks when necessary or obtained via a second fermentation. While many ales are cold conditioned (e.g. settle out rather than filter), lagers are commonly filtered using one of a variety of filtration methods. Finally, the beer is bottle conditioned and dispensed to bottles or kegs, or filled and pasteurized to maintain a longer shelf life. The beer is then labeled, packaged and finally distributed.

Impacts of Beer Production

Overall the sourcing, or incoming resources used in the brewing and production process, includes raw materials (e.g. yeast, hops, grains for malt), water, energy (e.g. electrical, thermal), packaging (e.g. bottles, kegs), and other miscellaneous consumables. The outgoing resources, which become part of the environmental impact, include not only beer, but air emissions (including greenhouse gases, acidic, noise and odor), and various solid and liquid by-products (spent grain, effluent, etc.) that may or may not be reused or recycled.

Olajire (2012) explains in great detail how the brewing industry is one of the largest industrial users of water, with

[3]There are variations of sparging, including English or batch sparging, which drains the wort completely, and German or fly sparging, which adds water as wort is drained. More recently, craft breweries such as Alaska Brewing Company are incorporating mash filter presses that require less water and produce greater wort extraction without compromising wort quality.

efficient breweries using about 4–7 L of water per 1 L of beer. Similarly, Kanagachandran and Jayaratne (2006) assessed 3–10 L of effluent (wastewater) generated for every 1 L of beer. However, the number increases remarkably when incorporating the amount of water used in growing barley—an estimated 298 L (78 gallons) of water for every 1 L of beer (Water Footprint Network 2013, data derived from Mekonnen and Hoeksra 2010, 2011). That said, the variability in water consumption during the beer production process depends on such things as the type and style of beer, the number and volume of beers produced, the processes used for washing, packaging, pasteurizing, heating, cooling, cleaning, and of course, the process of brewing (Olajire 2012, van der Merwe and Friend 2002).

Brewing also produces solid waste, including spent grains from the wort filtration process, wastewater solids after wort boiling, trub from wort boiling or fermentation, surplus yeast after fermentation, and sludge from the final steps of filtration and clarification of beer. Kieselguhr sludge has potentially serious economic and environmental ramifications as diatomaceous earth is used in the filtration processs, and is considered a non-renewable resource obtained primarily from open pit mining (Olajire 2012).

Most energy used in the production of beer takes place in the brewhouse, particularly with mashing and wort boiling.[4] National Resources Canada (NRCAN 2010) note that the typical cost of a well-run brewery includes 8–12 kW h of electricity and 150 MJ[5] of fuel energy per hectoliter[6] of beer produced. This equates to approximately 30 kg of carbon dioxide or equivalent (CO2e) emissions produced per hL of beer (NRCAN 2010). The Beverage Industry Environmental Roundtable (BIER 2012a) reported estimated carbon emissions of beer at a finer scale; using life cycle assessments (LCA) and related inventories such as greenhouse gas inventories, the total carbon footprint per 355 mL aluminum can of beer for BIER companies[7] was assessed at a little more than 319 g of CO2e,[8] with 41 % of the carbon footprint being the can. In terms of the brewing process, about 33 % was attributed to the malt process and 12 % to brewery emissions (BIER 2012).

While the carbon footprint of beer may vary widely between breweries, particularly regarding brewing processes and packaging materials, the numbers indicate the need for sustainability in the brewing industry. In response, we surveyed regional craft brewers to assess the current sustainability trends in the industry by way of environmental sustainability, economic sustainability, and equity (social and cultural) sustainability. These next sections review the pillars of sustainability, and address how regional craft breweries assess their own opportunities and challenges in providing and promoting sustainability (whether directly or indirectly) without compromising the quality of the beer produced.

Sustainability

Sustainability is hard to define in the brewing industry, as it commonly represents different things to different brewers located in various (different) geographic locations. In fact, some brewers take issue with the word "sustainability" and prefer other terminology (e.g. "reduced impact," "environmentally friendliness"). Sustainability, as a concept, relates to the balanced relationship of behavioral conditions that impact the environment, economics, and society in a way that still provides humans (indefinitely) a viable present and future. Unfortunately, sustainability as a concept is commonly misidentified as sustainable development, which is defined by the Brundtland Commisssion (WCED 1987) as the "development that meets the needs of the present without compromising the ability of future generations to meet their own needs" (p. 43). Despite these perhaps subtle but markedly different concepts, the idea of the Three Pillars of Sustainability propagated from the Brundtland report is now a conceptual model used in sustainability standards and certification processes in various industries. These three pillars, referred to colloquially as the "Three Es," the "Three Ps" or the "Triple Bottom Line," include the following sectors of sustainability:

1. Economic ("Profit")—to promote and maintain a[n arguably] defined level of economic viability
2. Environmental ("Planet") –to promote environmental responsibility that supports a functional environment with maintained rates of depletion
3. Equity ("People")—to promote and support formal and informal communities and social constructs that are diverse, equitable, connected and encourage well-being and quality of life

Since 1987, various entities and academics have expanded and redefined the pillars of sustainability, due in part to the limitations established by the Brundtland Commission and its de facto environmental emphasis, vague definition of "social" sustainability (which is still both ambiguous and contentious) and general lack of clarity in both application and advancement.

As a result, various people and entities have attempted (with varying levels of success) to advance the definitions of sustainability and/or sustainable development. One example is Jon Hawkes' (2001) addition of a fourth "pillar" of cultural vitality, which establishes the importance of inherent values

[4] As a notable exception, Alaskan Brewing Company uses a special boiler that burns spent grain to generate electricity, thus using waste product and creating renewable energy from it.

[5] One MJ is 947.8 BTU or 0.2778 kW h, which equates to the amount of energy to light a 100-watt incandescent light bulb for nearly 3 h.

[6] One hL is 100 L

[7] These companies include ABInBev, Carlsberg, Heineken, MillerCoors, MolsonCoors, New Belgium, and SAB Miller.

[8] In comparison, BIER (2012b, c, d) report bottle water (500 mL bottle) having a CO2e of 80 g, carbonated soft drinks (355 mL can) at 200 g, and wine (750 mL glass bottle) at 1790 g.

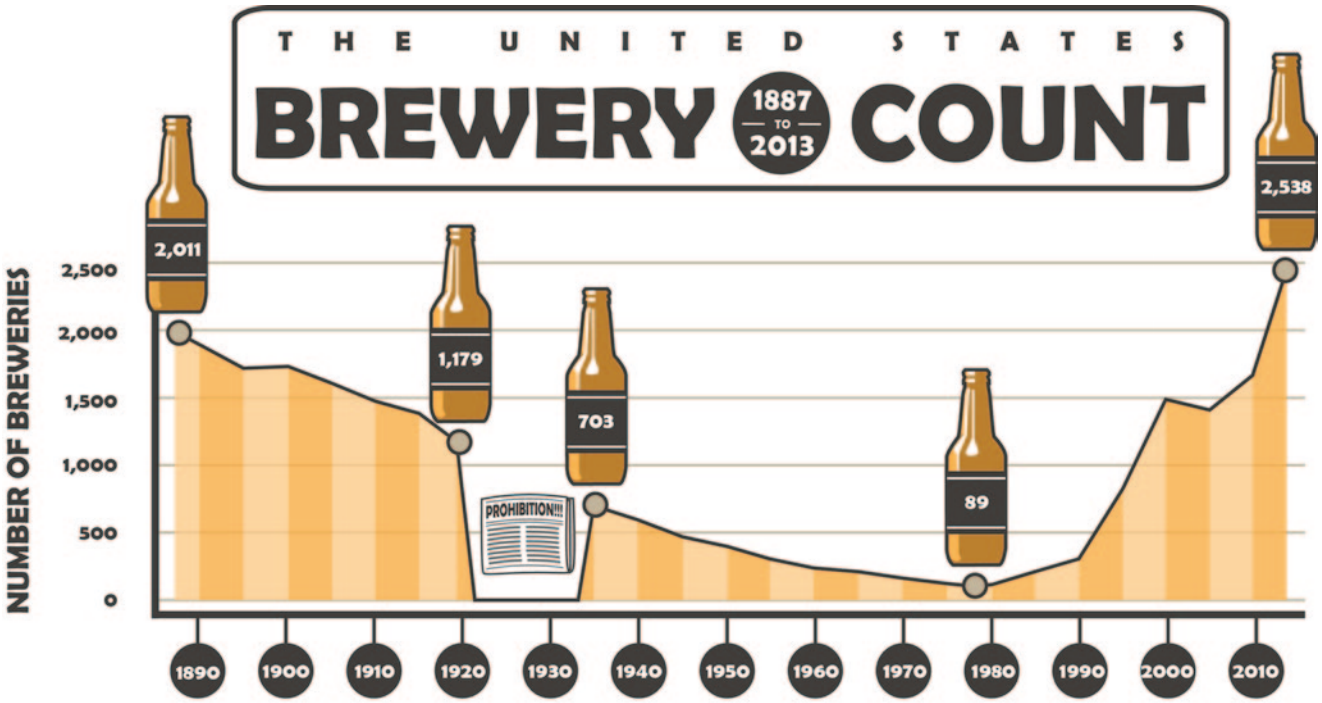

Fig. 11.2 The 126 year history of breweries open in the United States, from 1887 to 2013. (After Brewer's Association 2013)

held by [a] society and its overarching relationships with the pillars of social, economic, and environmental sustainability. However, we argue that social sustainability would (and should) naturally include culture as part its definition, instead of a more limited definition related to the social equity and justice in the context of sustainable development.

Regional Craft Beer

Regional craft breweries are recognized by the Brewer's Association (BA) as small, independent and traditional beer breweries. These three criteria are further defined as follows:

1. Small—annual production between 15,000 and 6 million barrels;
2. Independent—less than 25% ownership or control by non-craft brewers; and
3. Traditional—producing traditional malt beer by way of an all malt flagship or at least 50% of all beers (by volume) being all malt or with adjuncts that are used only to enhance flavor (rather than as a replacement of malt).

As a comparison, regional breweries fit between large breweries and microbreweries in terms of production, with large breweries producing over 6 million barrels annually and microbreweries producing less than 15,000 barrels annually (of which 75% is sold offsite). Craft beer refers to the type of beer produced by the brewers; one that incorporates unique styles and varieties, innovation, and commonly, varying levels of sustainability and localism/regionalism[9].

The simple origins of the American (U.S.) craft scene exploded from a meager eight breweries in 1980 to nearly 2500 breweries in 2013 (Fig. 11.2). In fact, 98% of all 2,538 breweries in the United States (as of June 2013) are considered regional craft breweries, microbreweries or brewpubs (BA 2013). Even though regional craft breweries constitute only 4% of all craft breweries (microbreweries and beerpubs collectively make up the other 96%), they nonetheless play an important role as they comprise a significant volume of the craft beer sold, and have a greater identity at the regional to national level.

Geographically, craft breweries are found in all fifty states and Washington D.C.[10] So common are craft breweries now that Brewers Association touts "the majority of Americans live within ten miles of a brewery" (BA 2013). However, only 97[11] regional craft breweries were open in the United States in 2012 (Fig. 11.3, BA 2013). Most regional craft breweries are found in historical beer regions of the United

[9] See Schnell & Reese's chapter on how local identify and place associate with US microbreweries, as well as Ebert's chapter on neolocalism in Canada.

[10] Batzli's chapter showcases the historical and contemporary geographic distribution of all US breweries open since 1890, categorized into six distinct periods.

[11] We calculated 94 as a few breweries were double listed or owned by the same company but brew under two names.

Fig. 11.3 Map of regional craft breweries, by location and per capita

States, particularly the Northeast where English and Dutch immigrants brewed traditional ales, and the Midwest where lager was popularized by German immigrants in the nineteenth century. Another region with high numbers of regional craft breweries is California, which is both the origin of the American craft beer movement (with Anchor in 1965) and of modern microbreweries (with New Albion in 1977). Other popular locations for regional craft beer include Colorado, which is the current home of the Brewer's Association (BA) and first modern brewpub (Wynkoop Brewing Company in 1988), as well as the Pacific Northwest, arguably the "beer terrior" of the United States with the production of grains as well as various strains of Pacific Northwest hops like Cascade and Chinook. Whether "regionalism" includes the adoption of sustainability actions and practices in the production of regional craft beer, or whether a culture of sustainability of all three pillars is inherent to all regional craft breweries, is unknown. Therefore, we surveyed regional craft brewers to determine if there is a consensus with, and perhaps a geography to, sustainability regarding regional craft breweries.

Survey Methodology

Regional craft breweries open in the United States in 2012 were identified by way of the Brewers Association website (brewersassociation.org). The original list contained 97 regional craft breweries; however, this number was reduced to 94 as three breweries were essentially listed twice (i.e. Boston and Sam Adams, Clipper City and Heavy Seas, and Schlafly and St. Louis). All breweries were then contacted by email or via the brewery's online website form with a link to the online sustainability survey[12].

The survey included questions that confirmed the regional status of the participating breweries, as well as questions focused on aspects of environmental sustainability, economic sustainability, and social sustainability as it applied to the beer industry, including the sourcing, production and distribution of beer. Each series began with a 4-point Likert scale question (where 1 is strongly disagree and 4 is strongly agree) on sustainability trends in the brewery, followed by

[12] following IRB guidelines

multiple choice questions that ask the brewery a set of sustainability actions applicable to their brewery (e.g. the brewery does not do it, used to do it, currently does it, or has plans to do this in the future). Finally, respondents could make additional comments at the end of the survey. In total, 21 of the 94 breweries responded to the survey. With the low number of responses, we only computed descriptive statistics.[13]

Survey Results

To begin, all surveyed breweries defined their breweries as regional craft breweries, i.e. small, independent, and producing traditional beers (predominately malt beers). Participating breweries produced between 21,000 barrels and 1 million barrels annually, with an average of 177,000 barrels and a median of 70,000 barrels produced annually. While the breweries were deemed independent, (10) breweries self-identified as corporate-owned; however, of the remaining breweries surveyed, (4) were employee-owned, (5) were family or privately-owned (5) and one (1) was in a limited partnership. Finally, all breweries produced traditional beers, with 15 having flagship ales, 5 with flagship lagers, and one producing both a flagship ale and lager.

Next, the three pillars of sustainability were assessed by a series of questions related to environmental, economic, and social (incorporating community, cultural, and corporate) sustainability.[14] Brewery respondents noted if their brewery has environmental sustainability goals of reducing the use of materials, reusing waste materials and/or increasing recycling rates. The average score was 3.3 (out of 4), with a median of 3.5, signifying that most agreed with this statement. In terms of the environmental sustainability actions taken at the brewery, particularly with regard to solids, all breweries surveyed (100%) collect spent grains for other purposes such as animal feed. Over 50% currently collect and 38% have plans to reuse yeast from fermentation for other purposes (e.g. vitamin supplement). In terms of packaging material, 62% have reduced packing materials, while 14% have plans to reduce packing materials. It is worthwhile to note that one brewery no longer invests in reducing packaging materials, but it is unclear from the limitations of the survey the reasons for this change. Finally, 67% invest in reusable or recyclable packaging.

Next, brewers noted if their brewery has economic and environmental sustainability goals of reducing water and energy use, increasing the use of renewable energy, and/or using the best technologies to reduce our impact on the environment in a way that is economically justifiable. With an average of 3.1 and a median of 3.5, most respondents agreed that their brewery had such sustainability goals related to water and energy. In terms of water, 76% have reduced water use, with 10% having plans to decrease water use. A smaller percentage (62) recover water, and only 14% have plans to do so in the future. Finally, 95% have installed or will install water meters to measure and control water consumption.

In terms of energy sustainability actions (related to both environmental sustainability and economic sustainability), 100% recover heat (e.g. from wort cooling or keg water systems) or plan to incorporate this technology in the near future. Similarly, 95% have installed various energy efficient technologies (e.g. insulated hot water, steam, and refrigerant pipes, brewhouse vessels, fermentation vessels and storage tanks, improve motors, installed destratification ceiling fans) to reduce energy use. Additionally, 81% have installed and 19% will install energy meters to measure and control energy consumption. However, only 33% use alternative sources of energy (e.g. solar, wind, water, waste), although 43% have plans to incorporate such alternative sources in the future.

It is perhaps ironic that 86% of breweries believe that incorporating sustainability leads to higher profits, yet only 57% have a systematic review of operations to assess and improve overall sustainability. This number, however, rises to 86% when adding in the breweries that have plans to incorporate a review process. Only one brewery no longer has a systematic sustainability review of operations. Moreover, few breweries (29%) have had a greenhouse gas or carbon footprint audit.

Brewers were also asked a series of questions related to the use local and/or organic materials and resources—water, hops, grains/cereals, yeast and adjuncts—used in the brewing process. For this survey, local was deemed as within 100 miles and/or in state boundaries. Results suggested that most agreed or strongly agreed (3.3 average, 4 median) that their brewery has local and/or organic sustainability goals related to raw materials used in the production of beer. In terms of local resources and material, 90% use a local water source, 57% use a local hops, 43% use local grains/cereals, 62% use local yeast, and 29% use local adjuncts. In terms of organic material, 24% use organic hops, 19% use organic grains, and 10% use organic adjuncts. While one or two breweries have plans to use more local or organic materials, more apparent is the fact that 10% no longer use organic hops, grains, and adjuncts. All in all, brewers are trending toward local materials over organic ones.

Next, breweries were asked a set of questions related to social and cultural sustainability. First, the breweries were asked if they have social sustainability goals to support the workforce. Results suggested that most agreed or strongly agreed

[13] William Gossett, an employee of Guinness (as in the beer), developed the *student's t-test* to assist in quality control. His research determined that an *n* of 30 was needed such that results from tests of differences would be statistically significant. See Student 1908.

[14] One brewer found our use of the term "sustainability" misleading and noted that "no brewery or manufacturer can exist today without the outside input of petroleum products—thus it is not really "sustainable" in the long term—a better term might be reduced impact or environmentally friendly." We note here their concern but that our definition of sustainability equates to, rather than contrasts, their suggested alternative terminologies.

(3.5 average, 4 median) that the brewery supports the workforce, as well as the local community (average 3.3, median 4). In terms of the workforce, 81% offered (with another 5% soon to offer) job training and enhancement opportunities. Similarly, 81% recognized good efforts and potential for increase responsibility (e.g. job promotion) while 90% believe they provide rewarding work environments (e.g. resources provided, trusting environment). Moreover, 76% promote workforce diversity, with one brewery no longer promoting diversity. As for safety, 71% have (and an additional 10% having plan) for responsible preparedness with emergencies.

Most breweries not only provide goods and services, but also living wage jobs (86%). However, the most notable aspect of all breweries is their full commitment to social sustainability by way of supporting the local community; all surveyed breweries (100%) support non-profit organizations in the local community, sponsor events via donations, and organize and fund charitable events. Additionally, 81 of the surveyed breweries have employees volunteer for charities and social causes.

Finally, the breweries were asked if they have visible economic, environmental and/or sustainability goals and commitments. Results suggested that most agreed and some strongly agreed (3.4 average, 3.5 median) that the brewery supports sustainability via sustainability policies, institutional culture, and education. All breweries (100%) take steps to meet or exceed environmental laws and regulations, with 71% meeting (14% with plans to meet) pledged conservation or sustainability commitments. Overall, 71% have a vision or mission that includes or will include some form of sustainability (e.g. economic, environmental, and equity); only one brewery noted that they no longer incorporate sustainability into their vision and/or mission. Sixty-two percent of employees are trained on aspects of sustainability, and 24% have plans to train employees. Finally, less than half (48%) use sustainability as a marketing tool, although four breweries noted future plans to do so.

Conclusions

Whether it is due to consumer interest, the increased cost in production or the need to meet governmental regulations or guidelines, regional craft breweries are pledging (and frequently succeeding) at implementing various measures related to sustainability. Despite the potential for unsustainable practices, the adoption of sustainability principles and actions is evident, and regional craft breweries are partaking in various means to assess the environmental impact (and many times, the associated economic losses) of their company. While limited by the relatively small percentage of respondents, the survey results shows that many regional craft breweries are trying to integrate all three pillars of sustainability into their operations.

Of the regional craft breweries surveyed 29% participate in carbon footprints, which assess carbon emissions from activities related to sourcing, production, and product distribution. Additionally, many are further reducing their carbon footprint with the adoption of energy efficient technologies, local ingredients (water, hops, grains and yeast), and efficiencies in water and energy use. These in turn mitigate costs, or even result in higher profits, all while decreasing overall energy consumption and carbon emissions. However, we assess that more breweries need to assess their carbon (and energy) footprints, as the majority of craft breweries responding do not systematically monitor their overall environmental impact. Additionally, regional craft breweries must continue adopting technologies and even alternate energy sources (solar, wind, etc.) to further both the environmental and economic sustainability pillars of the industry.

The social pillar was arguably the strongest of the three in terms of adoption and importance. Social equity (the standard definition of this pillar) was evident in the workplace, through such means as job training and advancement. The strength of this pillar is the relationship(s) with the local (to regional) community. Not surprisingly, all breweries supported their local communities through donations and charitable events, which we argue, create or maintain a sense of loyalty among its drinkers. This type of marketing tool is essential in creating a local (or more accurately, regional) brand that unlike wine and grapes, cannot always use their location (climate and soil) to source ingredients (hops, barley etc). However, we argue that regional craft breweries can feed off the hyper-local sensibility of place and identity found with smaller craft breweries by maintaining the inventive regionalism of styles and varieties that makes the geography of craft beer as relevant as ever.

Finally, a dichotomy of corporate/cultural sustainability exists with the beer industry as a whole. Craft breweries tend to have closer connections to local communities, but many do not conduct carbon footprint or greenhouse gas audits. Conversely, large non-craft breweries may not have such close community connections, but they all conduct such audits. Additionally, less than half of all regional craft breweries showcase sustainability on their websites, yet nearly all have been covered in traditional or social media sites (e.g. beer blogs etc.) touting various examples of sustainability, most notably environmentally-oriented sustainability. We assess that the majority of regional craft breweries are commonly in better positions (owing to economics of scale) compared to larger breweries to make small, sustainability-related changes in their sourcing, production, or distribution. Indeed, the presence and adoption of the three pillar of sustainability is widespread in the regional craft beer industry and we expect this trend to continue.

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Part III

Societies

The Origins and Diaspora of the India Pale Ale

12

Jake E. Haugland

Abstract

The origins and spread of the India Pale Ale (IPA) has geographic themes of immigration, diffusion, and globalization. Flemish immigration to the Kent region of England during the 1500s shortly led to the cultivation of hops, inevitably changing British beers styles. Pale malts produced with advances in industrialization in the latter 1600s later incorporated high levels of hopping rates producing high gravity pale ales and October ales, the ancestors of the IPA. These bitter beers where preferred in Tropical India by British colonists to the sweet dark ales. Soon they spread throughout the British Empire and were imported into North America as well. IPAs became highly copied by breweries across the globe until the late 1880s. German immigration to the U.S. and the global distribution of lagers greatly reduced the IPA's prominence as lagers were more preferred in tropical environments. The Temperance movement was an ideological act of globalization that discouraged the drinking of high gravity beers. The IPA declined as temperance and rationing for world wars made the high gravity IPAs less acceptable to drink over that of lagers. Later the U.S. would be the new home of the IPA, influenced by West Coast brewers. Citrusy American hops changed the IPA profile and further experimentation has led to hybrid IPAs that reflect a fusion of varying beer styles.

Introduction

> O that this too too sullied flesh would melt, thaw, and resolve itself into … a brew?

For the learned of classics the above is a twist on the work of Jolly Ole England's most famous playwright, William Shakespeare. Perhaps Hamlet, of whom spoke the above lines, wouldn't have been so despondent if he had quaffed down an English original now and then; specifically, an India Pale Ale or IPA for short. But sadly he was before the time of the IPA.

Like Shakespeare, IPA is an English original that has spread across the globe. It has waxed and waned, been reborn and become an entity that is not the sole propriety of its country of origin but has been transplanted and taken root in foreign lands, evolving with their local and regional charms. The IPA is a style that any aficionado of the ever-growing craft beer niche will know. It is a staple for brewpubs and micro-breweries and often the flagship beer style of craft breweries (Steele 2012). For the most part it resides in the 'craft beer' market. However there was a time when it was the global style of preference, the equivalent of today's dominance of the international lagers and pilsners (i.e., Budweiser, Corona, Becks…).

If we look at the name of the style, India Pale Ale, we see the word *ale*, which is the Anglo-Saxon term for what we now universally call beer (Pryor 2009). We see the descriptive term *pale*, which reflects the light color of the malted barley used to make the beer. Malted barley prior to pale malts were dark colored, which carried over to the production of less transparent, dark looking beers. Lastly we see the word *India*, the geographic name of a sub-continent and an important market for the English homegrown ale. What

J. E. Haugland (✉)
Division of Continuing Education and Professional Studies, University of Colorado-Boulder, 178 UCB, Boulder, CO 80309-0178, USA
e-mail: isbree@gmail.com

M. Patterson, N. Hoalst-Pullen (eds.), *The Geography of Beer*, DOI 10.1007/978-94-007-7787-3_12,
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a complex name! Not as simple as the name of other beer styles such as wheat, amber, or stout. The complexity of the name fits the origins and evolution of the style. What we now know as a hoppy, high gravity or high alcohol by volume % (ABV) beer is a product of scientific progress and industrialization, empire building, nostalgia for nearly a once forgotten style, and finally American brewery ingenuity.

In the following sections we explore the when, where, why and how of the IPA. Its ancestry, evolution, spread, rise, fall, and resurrection is discussed. Lastly we look at the current and future branches of the IPA as it continues to change.

Origins

In the beginning, there was dark, sweet beer ….

Ales of England were notably dark in color, and malty/sweet. The sweetness came from a lack of hops used in the making of beer. Considering the English once viewed hops as a "pernicious weed", their use in the brewing process only became acceptable in British beers long after their use by continental European brewers (Mosher 2004; Bamforth 2009). Records show the importation of hopped beers to England in the mid-1300s from Flanders, modern day northern Belgium. However it was not until after Flemish immigrants settled in the Kent region of southeast England that hops became a staple brewing ingredient. Upon arrival in the 1500s, Flemish immigrants grew hops for use in beer (Steele 2012). To this day the hop varieties grown in Kent—Kent Goldings—is known for having distinct bittering qualities and aromas and has in part taken the formal name of its geographical area.

Hop farming and use as an ingredient in beer expanded. In 1655 the English placed taxes on imported hops from Continental Europe, helping to increase the acreage of English hop farmers. Later, by 1800 acreage was well over 35,000 and upon harvest they were ready for the brew kettle (Cornell 2009).

The diffusion of Flemish brewing practices in England promoted and sustained the incorporation of hops into beer. This is vital for the evolution of what would become the IPA. IPAs then, as now, were known for having high bitterness levels. The appreciation of bittering can best be described as incremental for many palates, so the Flemish perhaps gave English beer drinkers a base point from which they could eventually increase and grow into. Hops add bitterness to beer and reduce the sweet, malty taste of the malted barley (Bamforth 2009). High bittering rates later would be appreciated by beer drinkers of the Tropics for their thirst quenching qualities compared to sweet malty beers (Steel 2012). Lastly, resins within hops are antibacterial in nature and thus have a preservative affect which improves shelf life and decreases spoilage rates (Bamforth 2009), an ideal trait if taking beer on a six month boat ride to India.

Coke, Pale Malt, and a Smile

The cultural assimilation of Flemish brewing styles greatly changed English brewing. However so did the onset of science and technology, which fortunately for the IPA and its pre-IPA ancestors happened to have originated in England, the hearth of the Industrial Revolution.

The paleness of what would become the IPA has to do with the English using coke for industrial purposes (Daniels 2000). The conversion of wood into charcoal is similar to turning coal into coke. In the 1600s the English, being fortunate to have an abundance of coal, noted that by heating coal to high temperatures the sulfuric, tarry, smoke characteristics are driven off. Coke is also better at regulating temperatures and was later used as a fuel source to drive the Industrial Revolution. Prior to this advent barley was kilned using other less reliable fuel sources to produce the fermentable malt. Wood, peat, straw, etc., where typically used. Not only were these fuel sources less reliable at regulating temperatures (i.e, dark roasted malt), their use contributed astringent, smoky by products to the malt and inevitably the beer. By comparison coke could kiln barley at lower temperatures, producing malt lighter in color and less astringent (Steele 2012). This malt became known as *pale malt* and led to new kinds of beers such as pale ales of the latter 1600s and then the October ales, Belgian tripels, IPAs and later the lagers and pilsners that dominate today (Steele 2012). These beers not only tasted different but they looked different, a characteristic that was later appreciated with the 1847 repeal of the glass tax. Before 1750 people felt lucky to have glass at all (Mosher 2004). By the mid-1880s, people could actually see their beer because glass had become affordable and indeed the golden amber color was a sight to see.

The October Surprise

In most likelihood the IPA started out as October ale (Hayes 2009). October ale exclusively used the newly developed pale malt, was high in alcohol content (8–12 %), heavily hopped, and was aged in barrels for up to two years (Steele 2012). Its namesake comes from the fact that prior to refrigeration brewing was a seasonal endeavor, starting in Autumn and ending in Spring (Mosher 2004). Brewing was halted during the summer months due to increases in microbial activity and the belief that pale malt fermented poorly when temperatures exceeded the low 20s C (70s F) (Steele 2012). Brewers at the time did not know about microbes, wild yeasts, and bacteria, but they knew that the summer months produced less than desirable results. The beers brewed at the beginning of the season, October, used only the freshest hops and malts, right after the harvest (Mosher 2004; Hayes 2009). The practice of exclusively using pale malt was initially done by country estate brewers and was favored by the wealthier country gentry

(Steele 2012). Dark porters were the drink of the common man and perhaps the discrepancy between the classes initially came from premium prices placed on the October ale ingredients, associated costs of kilning malted barley with coke, aging for years at a time, and the affordability of enjoying a pale beer in an expensive glass. These same country gentry later would also happen to be the colonists in India wanting a *taste of home*, a beer terrior of England (Cornell 2008). However by the mid 1700s beers made from pale malt were no longer the exclusive drink of the country gentry. Commercial breweries in London began brewing pale beers alongside the ubiquitous porter (Cornell 2003).

Distribution

Rise of the Commercial Brewery

With the onset of the Industrial Revolution in the mid to late 1700s a noted decline in home, farm, and country estate breweries occurred. This decline is attributed to internal English migration where workers left the farming lifestyles for the urban factories (Bamforth 2009); the rise of commercial brewing had begun. Taking advantage of industrial innovations urban breweries efficiently sprung forth to quench the thirst of densely populated industrial centers by producing massive volumes of beer. Workers often obtained better wages and no longer worked from dusk to dawn as they once did on the farm, allowing for free time to be spent at local taverns. Porters were the dominant beer style consumed, but the pale precursors of the IPA were brewed side by side with the darker beer styles (Steele 2012). Perhaps this was to satisfy the more expensive and sophisticated tastes of a growing middle class trying to emulate the country gentry? Regardless the movement of the pale beers from the country to the urban, commercial breweries was vital for what would become the IPA. During this time transportation networks such as canals, roadways, and later railways were being established (Pryor 2009), changing the relative location of brewing centers with that of once far off markets. Breweries began to grow to sizes that spread for acres. Brewery annual production could not feasibly be consumed by the local surrounding neighborhoods yet with newly developed transportation networks a means of export was established, both within Britain and beyond (Steele 2012). This would become fortuitous for the IPA. Globalization of British pale ales had begun and their spatial distribution increased all during the ascension of the British Empire.

Rule, Britannia! Britannia, Rule the Waves!

With an expansive empire in which the sun never sets, the British had thousands of civilian, bureaucrat, and military personal spread across the globe. The relocation and periodic movement of these individuals created a thirst for home. They were skeptical of the local cuisine and drink. For example, colonists in India often preferred imported British beer to that of the local tropical water (Tomlinson 1994b). Beer could not be successfully brewed in tropical climates prior to refrigeration due to spoilage of ingredients and nasty microbial infections producing off tastes, hence a need for importation (Monkton 1966). Enter the East India Company.

Established in the early 1600s, the East India Company had a virtual trading monopoly between India and Britain. There was a trade deficit with less trade on ships to India than coming back. Ship's captains of the East India Company were allowed specific amounts of personal cargo on India bound ships to be sold to colonists (Steele 2012). Beer was often part of that cargo. The term India in "India Pale Ale" comes from that exchange. There is some disagreement on how exactly IPA came to be traded in India. Some speculate that the six month long arduous journey through frigid and tropical waters called for the engineering of a hardy beer that could survive the voyage. In the hulls of ships beers rocked to and fro in wooden casks, first in cool English waters approximately in the low 10s C (50s F), crossed the equator along the African Coast, rounded the Cape of Good Hope, and crossed the equator entering the Indian Ocean with sea temperatures in the low 30s C (80s F) (Tomlinson 1994a). Exploding casks and spoiled, sour beer were not uncommon upon arrival. So theories abound about a conscious engineering approach where a beer style became a cultural invention (Pryor 2009) or developed to solve a geography (distance) problem (Tomlinson 1994a) (Fig. 12.1).

Others claim that beers of various styles and strengths, mostly shipped from London in the 1700s, successfully arrived in India (Steele 2012). Brewers at the time knew that hops had preserving qualities (Bamforth 2009) so hopping rates were increased for all India bound beers, sometimes by a third to a half (Steele 2012). Therefore, if other beer styles besides pale, strong, hoppy beers could survive the journey, how did IPA come to be?

Location, Location, Location

The East India Company headquarters was located in East London near the confluence of the Thames and Lea Rivers. Two miles upstream on the Lea River near the Bow-bridge was the Bow Brewery, founded by George Hodgson in 1752 (Pryor 2009; Steel 2012). George Hodgson was mainly a brewer of porter, but he also brewed an October beer that was renowned for being strong and hoppy, popular with the gentry (Cornell 2003). Hodgson quickly developed relationships with officers of the East India Company, whose ships were moored two miles downstream. Being located on a navigable river and having favorable credit terms where ship's captains were given 12–18 months to pay back the brewery

Fig. 12.1 The long, six month, arduous journey of IPA from English ports to India is shown. Constant rocking in casks and changing sea surface temperatures complicated successful delivery of quaffable beer.

upon return from India, the Bow Brewery became the brewery of preference for entrepreneurial captains (Hayes 2009).

Hodgson already used large quantities of hops in his October ale and captains of the East India Company noted that it sold well. With the beer being highly hopped and higher in alcohol content, both preservative qualities (Bamforth 2009), they most likely had lower attrition rates than that of other beer styles and therefore better returns to the ship's captains. This was also a favorite beer of the wealthier gentry of whom populated the bureaucratic and officer ranks and most likely appreciated a comfort from home (Pryor 2009). Additionally, beer drinking preferences changed in the tropics. Darker, sweeter ales were less satisfying than the thirst quenching paler, drier, more bitter ales (Tomlinson 1994b). Hodgson's October ale quickly became a standard beer shipped to India. It was not originally engineered specifically for the voyage to India but was one of his stock beers that with increased hopping rates for the voyage, as with all beer styles of the time, grew to prominence (Steele 2012). He quickly established a monopoly on beer to India. Hodgson shipped a variety of beers, including Porters, but his October ale made his fortune. This October ale would later be referenced to as the first India Pale Ale, but not until the early to mid 1800s (Hayes 2009; Steele 2012).

Burton-Upon-Trent: An IPA Epicenter

In 1822 Hodgson's beer was still referenced as being one of the finest October ales (Cornell 2008). The term India Pale Ale had yet to come. However the Bow Brewery's monopoly was soon to be broken. George Hodgson's grandson, Frederick was now the patriarch of the family brewery. The Bow Brewery, especially under the auspices of Frederick Hodgson was considered to be less than ethical regarding business practices. Price fixing practices were apparently common

(Tomlinson 1994a). If the Bow Brewery got word of another brewery shipping beer to India, a flood of cheap beer would drive the prices down frightening off or bankrupting the competition. The following year with a reestablishment of a monopoly, the Bow Brewery would limit the amount of export, skyrocketing the price. Prices would range from 20 £ per hogshead (large cask) of beer to 200 £ per hogshead the following year (Steele 2012). Frederick Hodgson's business practices were becoming increasingly less and less appreciated, especially by the East India Company (Hayes 2009; Steele 2012).

Legend has it that Campbell Majoribanks, director of the East India Company, approached Samuel Allsop, a brewer northwest of London at Burton-Upon-Trent. Majoribanks gave Allsopp a bottle of Hodgson's pale October ale and asked if he could replicate it. Upon tasting the bitter ale Allsopp's head brewer, not used to the highly hopped ale is said to have spit it out. However Allsopp was more than happy to oblige Majoribanks and the first test batch was brewed in a tea pot (Steele 2012). As mentioned, *legend has it* for another contemporary Burton brewer of Allsopp was Samuel Bass. His Bass Brewery also has the same story where a director of the East India Company approached Bass and enquired on the making of an equivalent to Hodgson's October ale. Apparently the Hodgson family and the Bow Brewery were becoming despised for their business practices. The story even made its way into the popular culture a few decades later. Charles Dickens series of publications known as *Household Words* describes the same story but with this rendition the East India representative meets with the fictional Sir John Barleycorn of the beer trade (Pryor 2009).

Burton-upon-Trent was not an indiscriminate, novel choice for the East India Director to approach. It already had a long history of brewing dating to the establishment of an Abbey circa 1000 A.D. Burton brewers were known for their beer travelling well compared to beers brewed elsewhere. This later would be attributed to the chemistry and hydrology of the ground water used for brewing. Being located in central England and land-locked, the development of canals in the late seventeenth and early eighteenth centuries allowed means to export to the port of Hull and beyond (Steele 2012). Commercial brewing soon ensued and Burton-upon-Trent became a functional region associated with mass brewing.

The Burton area, like London, had become a commercial brewing epicenter, far exceeding the drinking capacity of the region. Their ales were therefore in need of export. The Baltic nations and Russian nobility of St. Petersburg favored the strong, dark, amber ales of Burton. Soon however Russia initiated a trade war in 1783 with a 300 % tax on English Ales, most likely to support national breweries. Burton brewers then turned to Poland and Prussia but the Napoleonic Wars of the early nineteenth century shut down that trade as well. By the time of the legendary meeting between the East India Director and the Burton brewers a significant decline in exports had already occurred since the 1780s (Steele 2012). They were ready for a new market, and if need be a new beer.

This was fortunate for the next evolutionary stage of what is now called the IPA. Burton-upon-Trent has a different physical geography and groundwater hydrology than that of the London region, resulting in mineral laden ground waters that produce a crispier, drier, more thirst quenching ales.

Hard Vs. Soft

The physical geography and hydrology of an area impacts the quantity and quality of water used in the brewing process. Today as in the past, brewers interact with their environment and use the water that they have on hand. Groundwater is preferable to that of surface water for its general lack of contaminants and biological activity (Bamforth 2009). The difference between the two commercial brewing epicenters of Burton and London is that geography has dictated that Burton has hard groundwater while London has soft groundwater (Hayes 2009). Hard water has higher concentrations of sulfates and calcium, minerals derived from the local bedrock that inevitably become entrained in the groundwater through hydrological processes. The higher calcium content allows for better starch conversions, producing a drier beer with less residual sugars (Steele 2012). Calcium also improves extraction of hop bitterness and reduces haze by increasing yeast flocculation (Tomlinson 1994b; Bamforth 2009). Sulfates change mouthfeel and the perception of bitterness, allowing for the hopping rates to be increased without lingering astringent aftertastes (Tomlinson 1994a; Mosher 2004). Soon Burton breweries such as Allsopp and Bass were competing side by side and being preferred to the Bow Brewery's pale October ale in the Indian market. They were drier, more hop forward, and had better clarity and overall consistency to that of the London juggernaut, the Bow Brewery. This resulted in a beer that not only travelled better due to less residual sugars that might lend to souring and spoilage, but a beer that was better at quenching tropical thirsts and simply more pleasing to look at (Pryor 2009; Tomlinson 1994a). Hodgson initially still had a large market share over that of the Burton breweries, so marketing strategies describing the tonic like qualities of Burton pale ales brewed for India came about. By the 1840s this had manifested into the term or equivalent of what today is called an India Pale Ale. So it was not until after the Burton breweries got into the Indian beer market, long after Hodgson and his Bow Brewery first shipped pale ales to India that India Pale Ale became a staple term referencing a beer style (Steele 2012).

The Burton, hard water style of IPA soon became standard and preferred over that of the original London soft water style. Hodgson's Bow Brewery was still in business however

his less than ethical business practices and the preferable waters of Burton led to a fortuitous style change. Hodgson's brewery increasingly saw a decline in market share and after several changes of ownership eventually went out of business and was later demolished in 1933 (Steele 2012). Burton-Upon-Trent had become the global hearth of the IPA.

The IPA Rises

The Burton region soon became a global brewing center going from a production of 300,000 barrels in 1850 to over 3 million barrels three decades later. The Bass Brewery was at the forefront of production and would later become the largest brewery in the world (Steele 2012). In the early 1880s it was said that a Bass Ale (IPA) could be obtained in any country of the world that had an Englishman (Bickerdyke 1886), a sign of the vast British global presence. But Bass was not the only brewery in the Burton region. Other British brewers soon came to understand that Burton groundwater was highly desired and by 1860 some 26 breweries were in the area (Steele 2012), cementing Burton-upon-Trent as a functional brewing region.

Burton IPA was not solely an export beer. Domestic consumption of IPA had skyrocketed and by the 1840s with the new completion of a railway network reaching Burton, Burton IPA could now be distributed throughout the rest of the country instead of being slowly distributed via canals to port cities (Hayes 2009). This changed the relative location of Burton and its marketable goods, mainly beer. Burton ales diffused across Britian and were suddenly more accessible. Burton IPAs were also popular in Britain because returning colonists from India craved the pale ales they had enjoyed in the Tropics. This combined with increased wages for workers and the view of IPA as a status symbol representing sophisticated palates honed on the exotic sub-continent helped increase its market share. A reduction of the glass tax in 1840 also meant that IPA could be purchased in bottles and enjoyed at home, or enjoyed in glassware at fine establishments, often chilled. It had entered the lexicon of popular culture. It was compared to sparkling champagnes. It had become vogue, no longer for the country gentry, but for the aspiring masses (Pryor 2009; Steele 2012) (Fig. 12.2).

Fig. 12.2 Edouard Manet's *The Bar at the Folies-Bergeres* (1882) shows an urban, swanky Parisian scene with the finest hospitality. Fruit, wine, cordials, champagne, and bottles of Bass Ale, an IPA shown with their identifying red triangles, can be found on the table.

Imitation is the Sincerest Form of Flattery

Naturally other breweries around the world strived to replicate Burton's success. Some breweries, like those found in Edinburgh Scotland where fortunate by having similar hard water to that of Burton. By the 1890s Edinburgh was exporting a third of all beer to India, much of which was IPA (Hayes 2009; Steele 2012). Other locales had a hit and miss success brewing IPAs to Burton standards, until advances in brewing sciences leveled the field.

Industrialization continued to fuel technical developments in the brewing sciences. Thermometers, microscopes, hydrometers, pumps to transport fluids, cast iron and later copper brewing vessels, and the use of steam all aided breweries in being able to consistently and efficiently produce beer. Yeast, thanks to Louis Pasteur, had become better understood and could be managed more efficiently for a consistent beer (Tomlinson 1994b; Steele 2012). Prior to this, yeast was thought to be important, yet was not understood to be a living organism. However the understanding of chemistry and groundwater analysis allowed IPAs to be produced to Burton standards outside of the Burton region (Steele 2012). By the 1850s some London breweries were dabbling with adding salts, notably gypsum, to their brewing waters (Cornell 2003). With continued experimentation and study, knowledge of ground water chemistry advanced. By the 1880s calcium and sulfate additions to local soft waters was standard, producing a Burton style water (Hayes 2009). The process of adding brewing salts to local waters, to this day, is known as Burtonization (Bamforth 2009). Now Burton-style IPAs could be brewed anywhere.

With knowledge of Burtonization IPA breweries no longer needed a Burton-Upon-Trent postal address. London, Scotland, North America, Australia, Norway, and Germany housed IPA breweries. Even the Punjab region of India had an IPA brewery, only though because the brewery was at 6000 feet above sea level and lacked the sweltering climate of the lowlands (Steele 2012).

By the late nineteenth century the United States was the largest importer of English beer. U.S. breweries replicated these styles with a majority being located in the Northeast.

A brewer of note was Peter Ballantine, a Scotsman who immigrated to the U.S. Scotland had become a respectful alternative to Burton style beers, so once established in his new home of Newark, NJ in 1840, he brewed a variety of Burton style ales, including an IPA (Steele 2012). His Ballantine Ale, an IPA, survived long after his death, and managed to resurface after prohibition. The brewery finally closed doors in the early 1970s but not before leaving its imprint on what would become some of the founding fathers of the American craft brewing scene (Jackson 1996; Bamforth 2009).

IPA reached its global zenith in the 1880s. They were brewed commercially around the globe thanks to Burtonization. With advances in industrial refrigeration, the development of steam ships and locomotives, along with the Suez Canal and global rail networks, IPAs now were brewed year long and transported quickly (Steele 2012). Soon though, the IPA was to enter into obscurity. An exodus of Central Europeans to new lands would allow for a diffusion of a new beer style (Mosher 2004). Combined with the temperance movement and the world wars the once global IPA would move into an endangered species status.

The IPA Falls

Temperance and War

Temperance was a global movement that started to make significant inroads in the latter 1880s (Steele 2012). In Britain as IPA had risen so too did the distilled spirit gin (Bamforth 2009). The ill effects of gin were wearing thin with segments of society and soon all alcoholic beverages were targeted. Public drunkenness was frowned upon, especially from the wealthier classes who were the traditional consumers of IPA. Factory owners grew tired of lost productivity from their workers. Tea soon became more acceptable to drink (Steele 2012). Public sentiments were such that governments got involved.

Social engineering approaches were taken to limit the extent of drinking. The British levied taxes on original gravities of beer. Original gravities reflects alcoholic potential. The higher the original gravity, potentially the stronger the beer (Tomlinson 1994a). The 8–10% ABV IPAs quickly became expensive to make and drink. Lower gravity beers such as *running ales*, ales that did not require long amounts of aging, and the emerging lower ABV styles of central Europe such as helles, lagers, and pilsners became more proper to drink (Steele 2012). Soon IPAs were either no longer produced in England or qualitatively had changed to such an extent that the term IPA on the label had little to do with the original parameters of the style, becoming nearly indistinguishable from the bitters and Extra Special Bitters (ESBs) of today (Tomlinson 1994a). This transformation of the style lingers on even today with British IPAs being of much lower ABV than U.S. craft IPA styles (Tomlinson 1994b).

World War I compounded the IPA's demise. British politicians and munitions makers complained that excessive drinking was doing greater damage to the war effort than German U boats (Bamforth 2009). This led to the Defense of the Realm Act which established drinking ages and hours of pub operations that tended to favor consumption of lower ABV styles (Monkton 1966). Rationing and beer ingredient availability also led to lower the gravities of all beers. Later with the onset World War II and similar concerns for a new generation, the IPA was nearly extinct from its original homeland by the onset of the 1950s (Hayes 2009; Steele 2012).

Like the U.K., war and temperance influenced much of the English speaking world, as well as Scandinavia. Unfortunately for the IPA and alcohol in general, the United States took a draconian approach to temperance with the onset of Prohibition. Prohibition closed most U.S. breweries for good and IPA production and recipes were lost (Steele 2012). British style ales were already in decline in the U.S. due to immigration influxes and changing beer preferences (Mosher 2004). After the repeal of Prohibition the heavier, more bitter IPAs had lost their following with most Americans, who preferred the lighter German and Bohemian style lagers and pilsners. Only a few British style breweries survived, including the producer of Ballantine Ale, an IPA (Steele 2012).

The Huns Lager Forward

It is claimed that Central European visitors to London during the 1700s dastardly engaged in industrial espionage, bringing back the secrets of making pale malt. This led to the development of white and later pilsner malts (Mosher 2004; Steele 2012). Helles, golden lagers and pilsner beer styles were the results which are typically lower in ABV and bitterness than IPAs. Originally lager production was seasonal with an abstention of brewing during the warmer months (Daniels 2000). However with industrialization and commercial refrigeration, lagers too could be produced and shipped year round, like the IPAs (Steele 2012).

Inhabitants of warmer climates such as Australia, India, and portions of the United States started to favor the crisper, more quaffable lagers. German brewers pounced on the decline of the IPA with breweries such as Becks establishing production facilities in India and Australia. (Steele 2012). With immigration to the United States, Germans and Bohemians substantially populated regions of the Midwest. Their relocation diffused lagers, and the beer style like the immigrants assimilated into U.S. society. The United States, once the largest importer of English ales, had made the switch from ales to lagers due to its changing demographics (Mosher 2004). The IPA was experiencing a meteoritic fall. By 1900 the English export of IPA was a remnant of its former self.

The combined impacts of temperance, which favored lower ABV styles, immigration and diffusion of lagers, and rationing due to war efforts, globally killed the distribution of the IPA (Steele 2012).

IPA Resurrection

The West U.S. Coast

The IPA was on the cusp of extinction. Regional and global consolidation of breweries and the lingering effects of temperance led to a loss of variety and diversity where the IPA had once reigned. Beer variety now was mainly defined within the lager or pilsner style. In the United States one of the last substantial producers of IPA, the Ballantine Brewery, finally shut their doors in 1971. Soon with the onset of the 1980s over 90% of all beer production in the U.S. was controlled by only 10 lager breweries (Steele 2012). Serendipitously before the Ballantine brewery closed its doors, their *Ballantine Ale* was introduced to future founders of the American Craft brewing scene. Ken Grossman of the Sierra Nevada Brewing Company and Frtiz Maytag of San Francisco's Anchor Brewery had been inspired by Ballantine's IPA. In 1955 Maytag graduated from Deerfield Academy, a prep school in Massachusetts where he was within the distribution of Ballantine Ale (Bamforth 2009). Later as proprietor of the Anchor Brewery he released *American Liberty Ale* in the early 1970s as a seasonal beer. It was heavily hopped for the time coming in with over 40 International Bitterness Units, or IBUs (Steele 2012). IBUs represent the system most commonly used to measure the bitterness of a beer from alpha acids found within hops. Depending on the variety of hops, the amounts used, and the style of beer, a beer will vary in its IBU profile. For example an American light lager may have between 8–12 IBUs (Daniels 2000), so the 40 IBUs of the *American Liberty Ale* was quite big for its time. By 1984 *American Liberty Ale* was a year round beer. Grossman's Sierra Nevada Brewing Company also released a seasonal IPA in 1981, known as *Celebration Ale* (Steele 2012). A market for hoppy, heavy IPAs was developing in California.

To the north in the state of Washington a Scottish immigrant to Canada as a child, who later moved to the state of Washington as an adult was Bert Grant. Bert worked in the brewing and hop industry prior to opening his own brewery in Yakima, Washington in the early 1980s. In 1983 he also brewed an IPA entitled *Grants IPA*, coming in close to 60 IBUs. What Grant, Grossman, and Maytag had in common was that they were not only from the west coast of the U.S., nor that they all brewed a variation of an IPA in a then, and perhaps even now lager world, but that they used an obscure hop to bitter their beers. The hops they used are called Cascade (Steele 2012).

American Hops

An American Beer Needs an American Hop

Cascades hops are American and were given their name from the Mountain Range of the Pacific Northwest. Their ancestry comes from the English Fuggle hop where they were experimentally bred in the 1950s as a resistant strain to mildew. During this time mildew and mold had wiped out hop producing regions in Upstate New York and hop production began to be concentrated in northern California and the Pacific Northwest. The physical geography of the U.S. West Coast and its summer time precipitation lows differ from the more humid eastern U.S. Therefore mildew outbreaks are less common during the growing season accounting for a clustering of hop production in California and the Pacific Northwest (Bamforth 2009). Initially brewers in America were hesitant to use the new Cascade hop variety, relying on the more traditional German varieties until a blight in the late 1960s and 1970s once again devastated traditional German hops, skyrocketing prices. The newly named Cascade hop was suddenly attractive and acreage increased in hop growing areas of the Pacific Northwest. Maytag, Grossman, and Grant, all ale producers, latched on to this new variety (Steele 2012). The citrusy grapefruit aroma and character of the hop profile was very forward for the time in a lager dominated culture, different from the spicy, earthy characteristics of traditional European hops (Hausotter 2009; Steele 2012). The American style IPA had been born.

The resurrection of the IPA took an American turn. The success of the Anchor, Sierra Nevada, and Grants Yakima brewing companies helped initiate a cluster of brewpub and small brewery openings during the 1980s. These breweries initiated a contagious diffusion of fine scale brewery operations. The San Francisco Bay Area, Portland, OR, Seattle, WA, and later Boulder CO, were the renaissance hubs of this craft beer scene (Steele 2012). Perhaps the closer proximity to the Cascade hop growing region than other regions of the U.S. explains the use of this new hop variety for these brewing renaissance hubs? Cascade hops initially had terrible storage stability (Mosher 2004) so brewers in Seattle and San Francisco may have had less concern on using Cascade hops than brewers in Boston or Miami. Cascade hops increased in popularity and IBUs were continually driven upward on predominantly ale style beers. This success led to the development of new hop varieties that were "Super Cascade" in nature. They were cascade hops on steroids with a very forward citrusy aroma. Centennial, Chinnook, Columbus and later Amarillo, Simcoe, and Citra hop varieties were experimentally designed and successfully marketed (Mosher 2004; Steele 2012). Hops have what are known as alpha acids which contribute to the bitterness of beer (Daniels 2000). European style hops have alpha acids in the ranges

of 1.5–5% (Mosher 2004). American style hops may obtain a maximum range of up to 18% (Steele 2012). Not only are the American hops generally higher in bitterness but they produce citrusy beer profiles with peach, tangerine, mango, guava, grapefruit, lemon skin, tangerine, orange, and even pine being used to described IPA styles (Mosher 2004; Hausotter 2009). As craft breweries spread across the country, brewing a plethora of ales, the IPA soon became a rediscovered style that allowed for experimentation with the new American hops. By the 1990s patrons of small breweries had been cultivated into a new hop loving generation by brewers continually pushing the envelope with very hop forward IPAs (Hausotter 2009; Steele 2012). These new American IPAs were more in character to the original British IPAs of the past. IBUs and original gravity were high (Tomlinson 1994b). However the use of American hops led to bitterness levels and an aroma bouquet that was so distinguishable from its British cousin that in 2000 a new beer style recognizing the hop intensity of the American beer was recognized by organizers of the Great American Beer Festival (GABF), the largest annual beer competition in the United States (Steele 2012). Now American IPAs were separate from British.

The IPA Officially Emigrates

The IPA Becomes a U.S. Citizen

The English still favor lower alcoholic beers lacking the strong bitterness and hop profile of the original IPAs. There is currently a British equivalent of a craft beer scene IPA revival, however nothing compared to the U.S. (Tomlinson 1994b; Steele 2012). Hence the IPA is now as American as Apple Pie and the Fourth of July. This is illustrated by the fact that at the Great American Beer Festival (GABF), held annually in Denver, Colorado, the IPA category is one of the most anticipated events with the most numerous entries. Breweries compete for gold, silver, and bronze medals by beer style (Steele 2012). To gain an IPA gold medal is huge bragging and marketing rights for any craft brewery.

The American IPA has become such a valued beer style that it has leant itself to further experimentation and evolution. The U.S., known for its multiculturalism and fusion of varying ideas and ethnic styles, has allowed the IPA to be a template from which many brewers fuse other styles. It appears that the common thread for American IPAs and their ever increasing sub-categories has nothing to do with India or being pale; in fact, it no longer has to be an ale, as IPA/Lager-Pilsner hybrids have been created by several breweries (personal experience by the author). The common thread of American IPAs seems be the use of a lot of American hops.

IPA Branches Forth

A variety of styles have sprung from the American IPA. Perhaps the most marketable is the Double or Imperial IPA. Once again the West U.S. Coast was the hearth of the Double IPA. John Maier from the Rogue Brewing Company in Southern Oregon and Vinnie Cilurzo now owner of the Russian River Brewing Company in Northern California, originally brewed very hoppy, strong IPAs in the early 1990s. They are known to be the co-evolutionary designers of the double IPA. Soon the style spread southward. Big robust, over the top ABV (7–10%) hop bombs were brewed in the San Diego area. Stone Brewery, Ballast Point Brewery, and other San Diego craft breweries adopted the style such that it soon was referred to as the San Diego Pale Ale in limited circles. Note the lack of *India* in its name. The connectivity to the subcontinent has been lost. The production area of San Diego, known for high hopping rates has replaced the ancestral market of India in its stylistic nick-name. Officially though the style is referred to as a Double IPA and the category was later recognized as a separate beer style by the GABF in 2003 and is now common to most craft brewery markets (Steele 2012).

Another IPA offshoot is the Black IPA. The term itself is an oxymoron—how can something be black and pale at the same time? Once again the main theme for American IPAs is a beer that is highly hopped and high in gravity. The incorporation of roasted malts during the mash produce a dark amber to black, porter like looking beer. Some Black IPAs use de-husked roasted barley so that the beer is less astringent while others do not, producing a grittier stout like experience. Regardless IBUs are high and the most distinguishable aspect is the hop forward beer. Black IPAs have also been called Cascadian Dark Ale after versions brewed in the Pacific Northwest, yet non-Pacific Northwest residents are less receptive to the local place name of 'Cascadian' with their beer. The U.S. Brewers Association has struggled with the term being an oxymoron and has academically relabeled the Black IPA as India Black Ale in 2010 and then American Strong Black Ale in 2011, its current official name. No matter what it is called, fans of the style appear to be forgiving of using black and pale in the same beer name (Steele 2012). After all it is now all about the hops, not the color.

Belgian IPAs have risen to prominence during the 2000s as well. Belgian IPAs are truly a co-inspirational development between American and Belgian brewers, having established a series of brewing spatial interactions. Belgian brewers visiting the United States became inspired by American IPAs and brewed Belgian versions upon return. These European versions are often more similar to Belgian Tripels, being brewed with high levels of European hops (lacking citrus profiles) while using malts and yeasts of the regions. Belgian styles typically use a variety of sugar additions and 'beefier' barley styles, producing a sugary, malty beverage. American

produced Belgian IPAs are often Double IPAs but they have been inspired and fermented with Belgian yeasts (Steele 2012), yeasts that are distinctive from all other beer yeasts and that have perhaps more in common with wine yeasts than traditional lager and ale yeasts (Hieronymus 2005).

Onward and Forward

With lagers and pilsners globally inundating the markets, IPAs most likely will never regain their past glory. However they do continue to rise in global distribution. The hop forward American style IPA is now being produced and distributed in Denmark, Norway, Japan, Australia, and even England (Steele 2012). The Danish brewery Mikkeler for example has brewed an IPA with an astonishing 1000 IBUs. Modern day Double IPAs in comparison have upwards of 100 IBUs. This American influenced IPA brewed in Copenhagen has been distributed to the United States and this author has consumed it in Reno, Nevada. I should note that my lips and tongue where completely numb after consuming a glass of *1000 IBUs* and no other beers consumed afterward could be appreciatively tasted due to the lingering bitterness.

Perhaps to the bane of the American Brewers Association, IPA styles keep emerging. White IPAs, Session IPAs, Rye IPAs, Wheat IPAs, Pilsner and Lager IPA hybrids, and more are being created and brewed (Steele 2012). How one goes about defining a style and associated parameters must be at best quite frustrating, even for academics who thrive on defining terms. Do we base the name on ingredients, tradition of the style, or both? Regardless the common thread for any IPA is a hop forward experience. Perhaps a drinker of IPA can relate to the late U.S. Supreme Court Justice Potter Stewart who struggled in defining a threshold definition for obscenity in the Jacobellis vs. Ohio case of 1964. Failing to adequately define obscenity such that prosecutorial action could be taken, he stated,

> …I know it when I see it…

Since IPAs now apparently do not have to be pale, no longer have any association with India, nor do they have to be true ales, drinkers might borrow the strategy of the late Justice Potter in identifying IPAs,

> We can't define it, but we know it when we drink it!

Conclusion

Flemish immigration literally planted the seed for hop usage in England. Their relocation to the Kent region diffused hop usage and English ales inevitably changed in character with increasing bitterness from that of the original sweet, non-hopped ales (Steele 2012). Later these hops would be used for a new beer created with the onset of the Industrial Revolution and the advent of coke, a new reliable fuel source that could kiln malt consistently at low temperatures (Daniels 2000). Pale malt was the result. Pale ales, and October ales were originally brewed for the country gentry, while porters were the drink of the common man (Hayes 2009). However with industrialization, migration patterns changed in England and large commercial breweries were needed to quell the growing urban population's thirst. Pale October ales, known for being highly hopped, were now brewed alongside the ever present porters in metropolitan London as working wages increased (Steele 2012).

The British Empire continued to expand and British patriots abroad longed for goods, including the pale October ales of home. East Indian ship captains developed a favorable business relationship with George Hodgson and his Bow Brewery in the 1750s, which was only two miles from the East India Company headquarters (Tomlinson 1994a). This porter brewery also brewed a hoppy, October ale, which was soon favored in the Indian trade. It tended to have better survival rates and was preferable over that of the sweet, dark ales in the Tropics. The London pale beers later were replaced by Burton-Upon-Trent breweries due to ethical complaints with the Bow Brewery and favorable Burton waters. Burton breweries' hard groundwater leant itself to a new pale ale that was drier, crisper, better at hop extraction and eventually more preferable to that of the London soft water pale ales. The Burton region became the global epicenter of what was now labeled the IPA. With the understanding of groundwater chemistry other locales would soon Burtonize their water. IPA breweries spread like a contagion being brewed in North America, continental Europe, Australia, and even India itself (Steele 2012).

The dominant global style soon faded into obscurity though as temperance, world wars and German relocation and diffusion of lagers all combined to kill the once dominant global IPA (Steele 2012). In the 1980s they reemerged with craft brewers on the U.S. West Coast using American hops, known for their citrusy aromas (Hausotter 2009). Renaissance brewing hubs developed up and down the U.S. West Coast and in Boulder, CO during the 1980s and 1990s. These American style IPAs spread across the United States and became distinguishable from that of traditional British styles. In 2000 they were given their own category beer style by the American Brewers Association and have been replicated in multiple countries. As they spread, local regions impart their character into the IPAs and brewing spatial interactions between U.S. and mainly European brewers has produced a series fusion style IPAs, such as Belgian IPAs (Steele 2012). The future of the style will most likely continue to spawn new types and various hybrids, but all (should be) considered hop forward beers.

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The Ubiquity of Good Taste: A Spatial Analysis of the Craft Brewing Industry in the United States

13

Ralph B. McLaughlin, Neil Reid and Michael S. Moore

Abstract

The performance and composition of the U.S. brewing industry have changed dramatically over the past three decades. More specifically, the industry has experienced contradictory shifts in both aggregate production volume and number of firms. While aggregate beer production in the US has increased modestly, per capita beer production has decreased steadily since the early 1980s, dropping 26% from a record 26.2 barrels per person in 1981 to a low of 19.5 barrels per person in 2011. However, the number of brewing establishments increased substantially during the same period, expanding from 48 breweries in 1981 to nearly 1,700 by 2011–a 3,500% increase. So what explains this counterintuitive story? And how has this story manifested itself over space? This chapter seeks to answer these questions by analyzing the economic geography of the U.S. craft brewing industry. Specifically, our empirical approach consists of three exercises. First, we examine the temporal changes in the aggregate production volume and the total number of brewing establishments for each state. Second, we examine state-level variation in total beer production, total craft-beer production, percent craft beer production, and per-capita craft beer production. And last, we map the precise location of craft beer establishments to show the spatial and temporal distribution of active craft breweries in the US. Our results are three-fold. First, we find the change in total brewing establishments and total beer production has manifested itself rather unevenly over space. Second, we find that craft-beer production at the state level has also increased in a spatially uneven manner, as the largest production still occurs in the states with a history of high beer production. Last, and in contrast to our first two exercises, we find that within states, the location of active craft-brewing establishments have spread from major urban centers in the 1980s to many non-urban locations by 2011. We conclude that although growth in the craft-brewing sector will continue to be highest in areas with already high levels of brewing activity, there will be significant growth in regions that currently have few brewing establishments.

R. B. McLaughlin (✉)
Department of Urban and Regional Planning, San José State University, 1 Washington Square, San Jose, CA 95192, USA
e-mail: ralph.mclaughlin@sjsu.edu

N. Reid
Urban Affairs Center and Department of Geography and Planning, University of Toledo, 2801 W. Bancroft Street, Toledo, OH 43606-3390, USA
e-mail: neil.reid@utoledo.edu

M. S. Moore
Urban Affairs Center and Department of Geography and Planning, University of Toledo, 2801 W. Bancroft Street, Toledo, OH 43606-3390, USA
e-mail: Michael.Moore5@rockets.utoledo.edu

Introduction

The performance and composition of the US brewing industry have changed dramatically over the past three decades. More specifically, the industry has experienced contradictory shifts in both aggregate production volume and number of firms. While aggregate beer production in the US has increased modestly, per capita beer production has decreased steadily since the early 1980s, dropping 26% from a record 26.2 barrels per person in 1981 to a low of 19.5 barrels

M. Patterson, N. Hoalst-Pullen (eds.), *The Geography of Beer*, DOI 10.1007/978-94-007-7787-3_13,
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per person in 2011.[1] However, the number of brewing establishments increased substantially during the same period, expanding from 48 breweries in 1981 to nearly 1,700 by 2011—a 3,500% increase. So what explains this counterintuitive story? And how has this story manifested itself over space?

Much of the scholarly literature has examined the industrial structure of the brewing sector (Tremblay and Tremblay 2005), and shows the industry shifted from large-scale and oligopolistic production of a homogenous product—American pale lager—to a more competitive and dispersed production of a highly diversified product—craft beer (Ogle 2007). This shift towards production of craft beer—which is made in relatively small batches using a variety of high quality ingredients, methods, and styles—likely mirrored an internationalization of US consumers' palates. However, analyses of how the craft beer industry has manifested itself over space are few in number. We might expect, *a priori*, a spatially homogenous distribution of craft beer production. This is because unlike wine and spirits, freshness of craft beer decreases relatively quickly over time without refrigeration, and transportation of beer is more expensive when compared to other types of fermented beverages. Thus, all else being equal, the highest quality and lowest cost craft beer originates from local production. While other explanatory factors may certainly affect the geography of craft beer producers (such as state and local regulations and access to inputs), this need for freshness likely explains the seemingly ubiquitous appearance of hundreds of microbreweries and brewpubs across the county. The desire for craft beer on the part of consumers also reflects the interplay of a number of other factors, including the emergence of a niche market for more flavorful beers, rising incomes, and the growth of the "buy local" movement. While this transformation has been well documented in the scholarly literature (Baginski and Bell 2011; Kleban and Nickerson 2011; Murray and O' Neill 2012), little work examines the spatial distribution of craft beer production in the U.S.

This chapter seeks to fill this gap by analyzing the economic geography of the US craft brewing industry. Specifically, our empirical approach consists of three exercises. First, we examine the temporal changes in the aggregate production volume and the total number of brewing establishments for each state. Second, we examine state-level variation in total beer production, total craft-beer production, percent craft beer production, and per-capita craft beer production. And last, we map the precise location of craft beer establishments to show the spatial and temporal distribution of active craft breweries in the US. Furthermore, in our conclusion we map the number of breweries-in-planning to estimate the future spatial distribution of the brewing industry.

[1] 1 barrel equals 31 U.S. gallons.

Our results are three-fold. First, we find the change in total brewing establishments and total beer production has manifested itself rather unevenly over space. Second, we find that craft-beer production at the state level has also increased in a spatially uneven manner, as the largest production still occurs in the states with a history of high beer production. Last, and in contrast to our first two exercises, we find that within states, the location of active craft-brewing establishments has spread from major urban centers in the 1980s to many non-urban locations by 2011. We conclude that although growth in the craft-brewing sector will continue to be highest in areas with already high levels of brewing activity, there will be significant growth in regions that currently have few brewing establishments. The following sections provide a background of brewing in the US, our methodology and data, our results, and some conclusions.

The Brewing Industry in the United States

Economic Importance and Industrial Structure

The brewing industry is an important contributor to local, regional, and national economies in the United States. Data gathered by The Beer Institute (2011) suggest that in 2010, the industry was responsible for 1.84 million jobs and $71.2 billion in wages and benefits. The same data also show that total output was estimated at $223.8 billion, or roughly 1.5% of US GDP. Additionally, the consumption of beer generated $5.3 billion in federal and state excise taxes, $4.9 billion in state sales taxes, and $682.2 million in other beer-specific local taxes. While there are no current studies of the national economic impact of the craft brewing industry, there are a number of state level studies (Combrink et al. 2012; Metzger 2012; Richey 2012; Wobbekind et al. 2012). For example, the total economic impact (direct, indirect, and induced) of craft brewing industry in the state of California is estimated to be 30,591 jobs and $3.8 billion in economic output (Richey 2012).

The U.S. brewing industry consists of three segments (sometimes referred to as 'strategic groups'). The first segment comprises the "traditional breweries"—large-scale mass producers who predominately produce an undifferentiated product in the form of domestic-style pale lager. Today, the segment is comprised of two nationally marketed breweries: Anheuser-Busch and MillerCoors (although these are now part of two international corporations: AB InBev and SABMiller, respectively).

The second segment of the industry is made up of regional producers with an annual beer production of between 15,000 and 6,000,000 barrels. This segment consists of approximately 100 breweries. For example, the Boston Beer Co. (brewer of Samuel Adam's Boston Lager), Sierra Nevada Brewing Co. (brewer of Sierra Nevada Pale Ale),

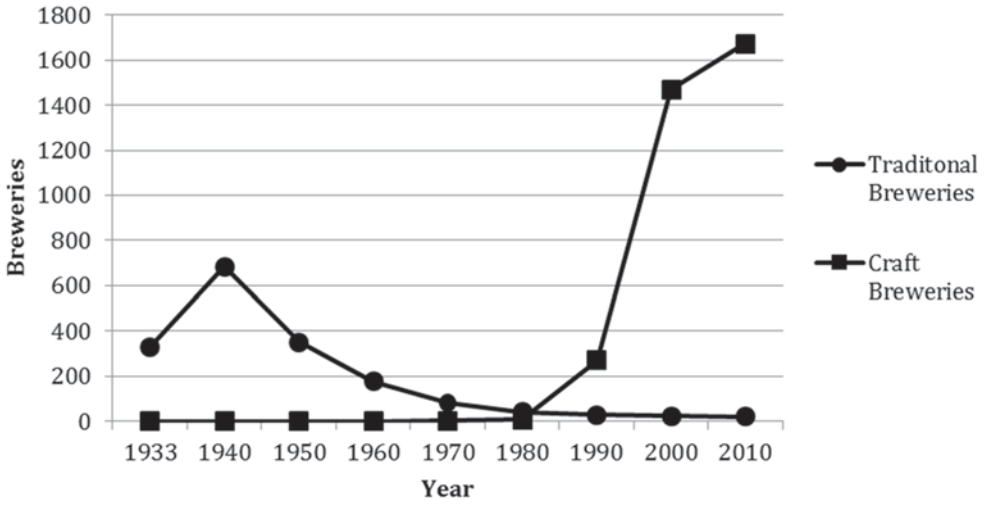

Fig. 13.1 Number of U.S. breweries, 1933–2010. (Source: The Beer Institute, Brewers Almanac, page 2)

and New Belgium Brewing Company (brewer of Fat Tire Amber Ale) are all classified as regional producers, even though much of the brewing world considers their products "mirco" or "craft" beer. In contrast, producers such as D. G. Yuengling and Son Inc. (brewers of Yuengling Traditional Lager) and North American Breweries (brewers of Genessee, and importers of Labatt and Imperial) produce beer that is more similar to the traditional breweries.

The third segment comprises what are termed "craft breweries." Firms in this segment are primarily microbreweries and brewpubs (Tremblay and Tremblay 2009), and can be divided into three sub-segments. First, there are brewpubs—restaurant-style brewing establishments that sell at least 25 % of the beer they produce to customers on site. Second, there are microbreweries—breweries that produce less than 15,000 barrels of beer per year and sell at least 75 % of their beer off-site. The third sub-segment consists of contract brewing companies that produce beer under contract for third party firms. Alternatively, it can be a brewery that contracts with another brewery to produce additional beer. The contract brewing company handles marketing, sales, and distribution of the beer, while generally leaving the brewing and packaging to its producer-brewery (Brewers Association 2013). Craft breweries produce a wide variety of full-bodied European-style beer such as India pale ales (IPAs), stouts, and pilsners, utilize high quality inputs (e.g. malts and whole cone hops), a slow brewing process, and ferment in small batches (Kleban and Nickerson 2011). It is the craft segment of the industry that is the focus of this chapter.

Brewery Concentration, Production, and Consumption

The number of traditional breweries in the United States peaked at 648 in 1940. By 2010 this number had decreased to 20 (Fig. 13.1). In 2011 the two brewers (Anheuser-Busch and MillerCoors) accounted for 75.1 % of domestic beer sales (Beer Marketer's Insights 2013).

Concentration in the brewery industry is explained by two major factors—technological changes in the industry that increased the minimum efficient scale of production and the advent of television in the 1940s that provided the larger brewers with a national stage upon which to market their product (Tremblay and Tremblay 2009). Generous marketing budgets also allowed the large breweries to brand their product with a premium image, thus differentiating it from that of the smaller traditional breweries, despite the fact that American brewers of all sizes were producing what was a largely identical and undifferentiated product (Clemons et al. 2006; Tremblay and Tremblay 2009). Smaller breweries, unable to compete with the huge marketing budgets of the larger breweries, were forced either into mergers with other struggling breweries or out of business altogether (Clemons et al. 2006; Tremblay and Tremblay 2009). Tremblay and Tremblay (2009) also suggest that changing consumer tastes (away from heavier to lighter beer) forced some domestic producers of full-bodied beer out of business. This did, however, create a void in the market. Initially, this void was filled by imported beers and latterly by domestically-produced craft beers.

With the exception of the prohibition-era, the volume of beer produced in the United States has generally increased since records were first kept in 1860 (Fig. 13.2). The rising production between 1860 and 1990 reflected rising demand, which in turn was driven both by population growth and rising per capita beer consumption (Fig. 13.3). Production peaked at 6.3 billion gallons in 1990. Since then production has decreased slightly to 6.1 billion gallons in 2010. Like aggregate production, per-capita production has shown similar trends. In 1860 per-capita beer consumption stood at 3.8 gallons. This number rose steadily until 1907 when it reached a pre-prohibition peak of 20.9 gallons. Following adoption

Fig. 13.2 Production volume of U.S. breweries, 1933–2010. (Source: The Beer Institute, Brewers Almanac, page 5)

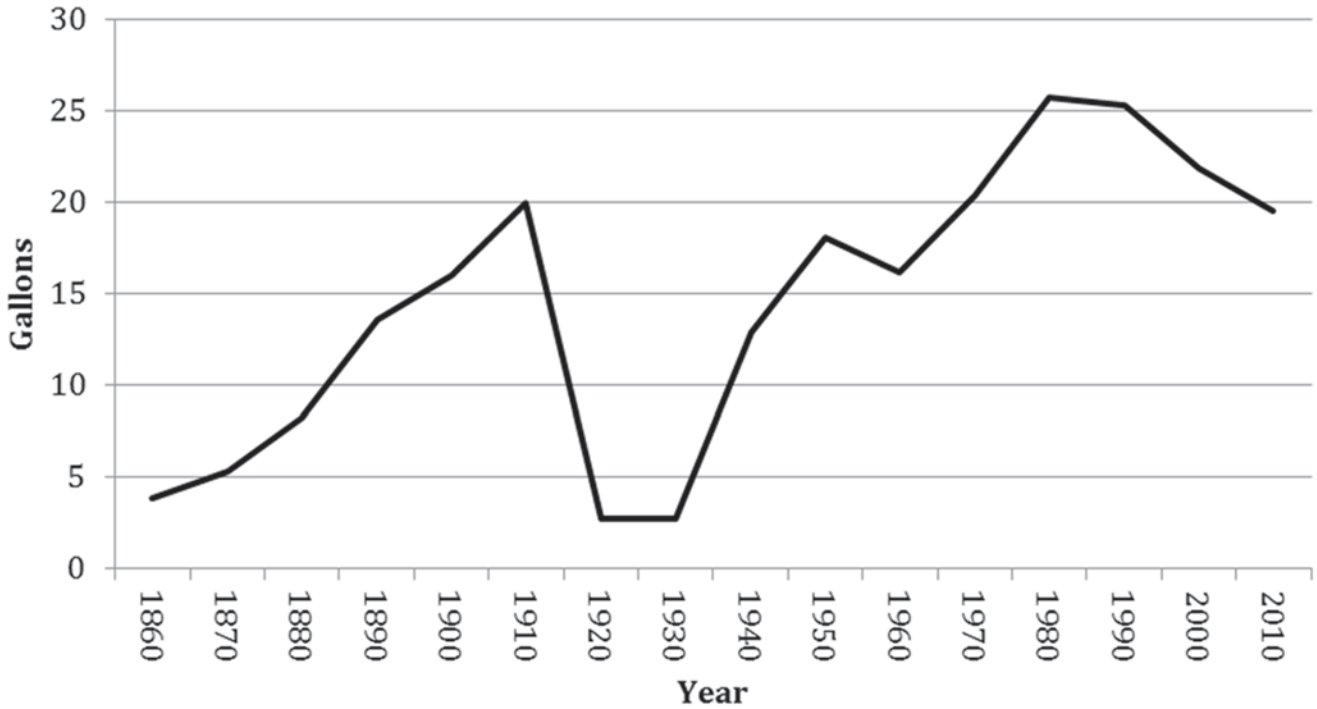

Fig. 13.3 U.S. beer consumption per capita, 1860–2010. (Source: The Beer Institute, Brewers Almanac, page 5)

of the 21st amendment to the US Constitution in 1933[2], per capita beer consumption quickly increased reaching an all-time high of 26.2 gallons in 1981. The post-1981 period has witnessed a steady decline reaching a low of 19.5 gallons per capita in 2010 (Fig. 13.3).

The Rise of Craft Breweries

While passage of the 21st amendment signaled the beginnings of the modern-day large-scale brewery, it was the signing of a bill legalizing home brewing by President Jimmy Carter in 1979 that paved the way for the modern craft beer movement. In the mid-1980s individual states began legalizing brewpubs; although brewpubs were legal in only six states in 1984, they were legal in all fifty states by 1999 (Tremblay and Tremblay 2011; Murray and O'Neill 2012).

The post-1981 decline in beer consumption per capita and the decline in the number of traditional breweries have been mirrored by a concomitant rise in the number of craft breweries (Fig. 13.1). Between 1980 and 2010 the number of craft breweries increased from 8 to 1,673. Unable to compete in terms of marketing budgets, craft brewers have been successful in the market place by providing consumers with a truly differentiated product that appeals to what Clemons et al. (2006, p. 157) refer to as "beer geeks" (the brewing industry's equivalent of wine connoisseurs). Resonance marketing—the tailoring of products to the specific demands of consumers, rather than their general demands—and beer rating websites (e.g. beeradvocate.com and ratebeer.com) have become critical in the evolution of the craft specialty beer industry (Clemons et al. 2006). Along with imported beers, craft beers are the only segments of the market that are experiencing any significant growth in sales and profits (Clemons et al. 2006). The craft brewing segment continues to post impressive growth figures in a period when the traditional segment of the industry is experience declining sales. For example, in 2011 overall U.S. beer sales by volume decreased by 1.3 %, while the craft beer sales increased by 13 % (Brewers Association 2013). Two major theories have been advanced to understand the existence and structure of the craft brewing industry: resource-partitioning theory and neo-localism.

Resource-Partitioning Resource-partitioning theory (Carroll 1985; Carroll and Swaminathan 2000) suggests that, as an industry matures, multiple segments may emerge. First, there are the generalists who capitalize on economies of scale to produce a relatively homogeneous product that meets the needs of the vast majority of consumers. In the US, these are the traditional breweries. The homogeneity of the product is reflected in the fact that consumers are generally unable to distinguish between the beers produced by the different traditional breweries (Allison and Uhl 1964; Jacoby et al. 1971). Over time, however, some consumers express dissatisfaction with this homogeneous product and a market evolves for higher quality and differentiated styles of beer. The craft brewers emerged to meet this demand. The power of resource partitioning theory is such that Carroll (1985, p. 1280) invoked it to predict the growth of the craft brewing industry in the United States—"although it is premature to make predictions, the US market appears ready for an upsurge of specialist breweries". As they are effectively appealing to different segments of the market, the generalist producers and the specialist producer are not in direct competition with each other.

Resource-partitioning theory is supported by strategic group theory. A strategic group comprises firms within an industry who pursue similar long-term strategies (Tremblay 2005) and are differentiated from members of other strategic groups by their structural characteristics (Caves and Porter 1977). Distinguishing structural characteristics can include degree of vertical integration, marketing budget, product line diversity, and geographic scope of market (Caves and Porter 1977). According to Caves and Porter (1977, p. 251), "a typical pattern in consumer-goods industries is the presence of a small group of producers of a full line of nationally branded goods and a larger group of producers of unadvertised goods, regionally branded goods, and producers for private labels." The existence of strategic groups is perpetuated when barriers to entry prevent members of one strategic group from entering the other. Barriers to entry into the traditional segment of the industry are driven primarily by the large investments that are required to take advantage of the economies of scale in production, distribution, and marketing. As a result, the craft brewers have satisfied themselves with meeting the needs of consumers who prefer more flavorful and distinctive beers that are not easily produced (or are very costly to produce) in large quantities. As such, entry into the craft segment of the industry is relatively easy and it is at this "competitive fringe" that we see new firms sprout and emerge (Caves and Porter 1977, p. 259).

The rise of such quality beer is especially evident when looking at the historical trends of materials used in the brewing industry (Choi and Stack 2005). Figure 13.4 shows the number of pounds of rice and corn—cheaper and lower

[2] The Twenty-first Amendment to the United States Constitution was ratified on December 5, 1933 and repealed the Eighteenth Amendment which had mandated nationwide prohibition on alcohol on January 17, 1920.

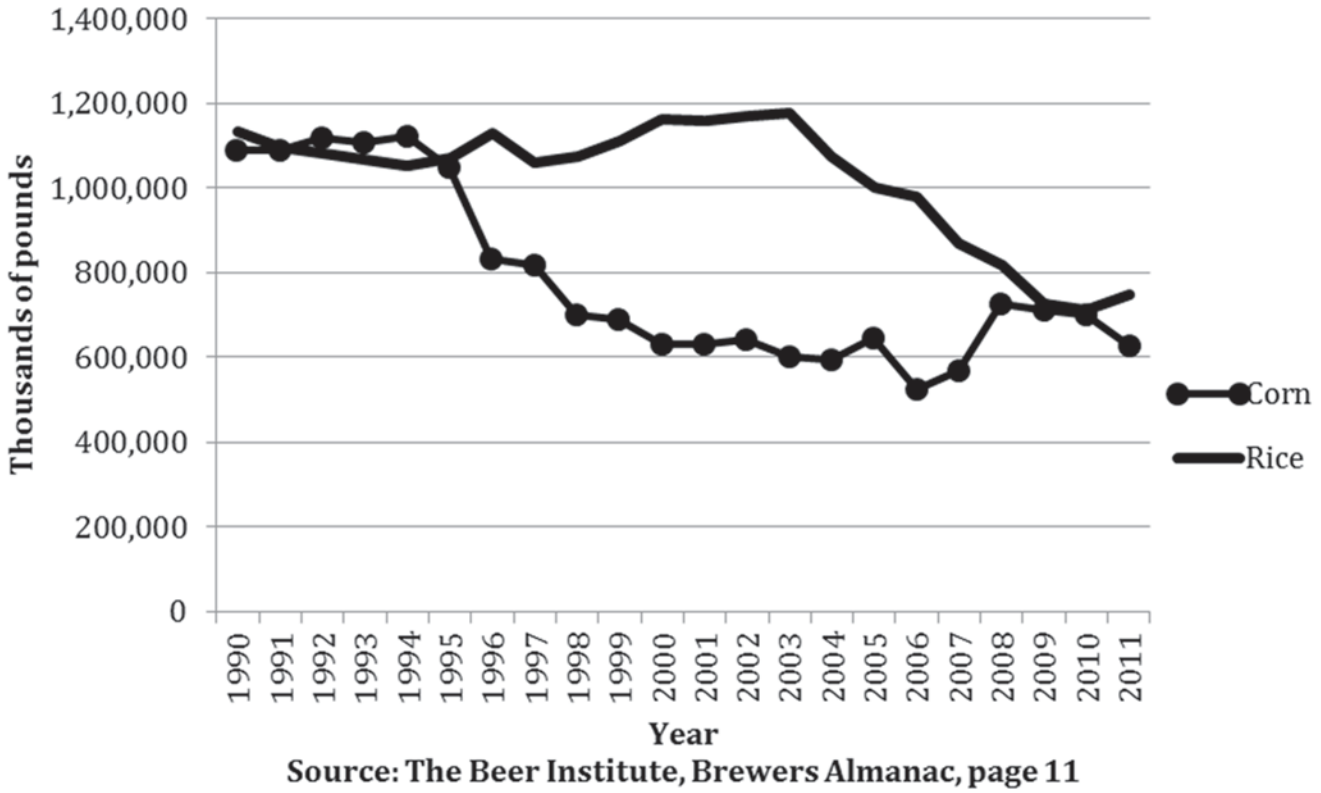

Fig. 13.4 Amount of adjuncts used in malted beverages, 1990–2011. (Source: The Beer Institute, Brewers Almanac, page 11)

quality brewing ingredients referred to as "adjuncts" in the brewing world—from 1990 to 2011. The overall trend has been downward, with the use of corn and rice falling from roughly 1.1 million pounds each in 1990 to approximately 630,000 and 750,000 pounds, respectively, in 2011. Conversely, the use of "quality" brewing ingredients—namely barely, wheat, and hops—increased dramatically during the same period. From 1990–2011, the use of barely increased from 1 to 123 million pounds, the use of wheat increased from 156,000 to 23 million pounds, and the use of hops increased from 44 to 107 million pounds (see Fig. 13.5). This shift represents an overall increase in the production of higher quality products by US breweries.

Despite this rapid increase in the amount of beer produced using high quality ingredients, the concepts of "lock-in" and "switching costs" have been invoked to explain the relatively small market share enjoyed by craft producers. Lock-in is the idea that particular technologies and products develop an early lead in the market place and are adapted by society with the result that they become dominant to the near exclusion of other technologies and products (Arthur 1989; David 1994). Once a technology or product becomes dominant, there are significant switching costs associated with changing to an alternative technology or product (Klemperer 1995). Choi and Stack (2005, p. 81) use the concepts of lock-in and switching costs to argue that the American public, for a variety of reasons, has developed a taste for "a generic style of beer despite the prevalence of more flavorful alternatives". Key events and trends that contributed to this lock-in include prohibition, the emergence of a consumer taste for soft drinks, the improvement in refrigeration and packaging technologies, and the invention of and consumer preference for nationally branded beers that were produced and marketed utilizing economies of scale. The result is that the "US market has become locked in a suboptimal equilibrium in which most consumers are no longer familiar with the full range of what beer is and can be" (Choi and Stack 2005, p. 85). As has occurred in the case of many other consumer products, the cost of switching away from nationally branded beers to craft produce beers has, for the majority of consumers, been too high. For most craft beers, the price per unit of beer is roughly double that of mass-produced pale lager. Furthermore, the taste of craft beer could also be considered a high switching cost—most craft beer has significantly more aroma, flavor, and/or bitterness than traditional pale lager, and thus may inhibit rapid switching amongst individual consumers.

Neo-Localism The concept of neo-localism has also been invoked to explain the increasing popularity of craft brew-

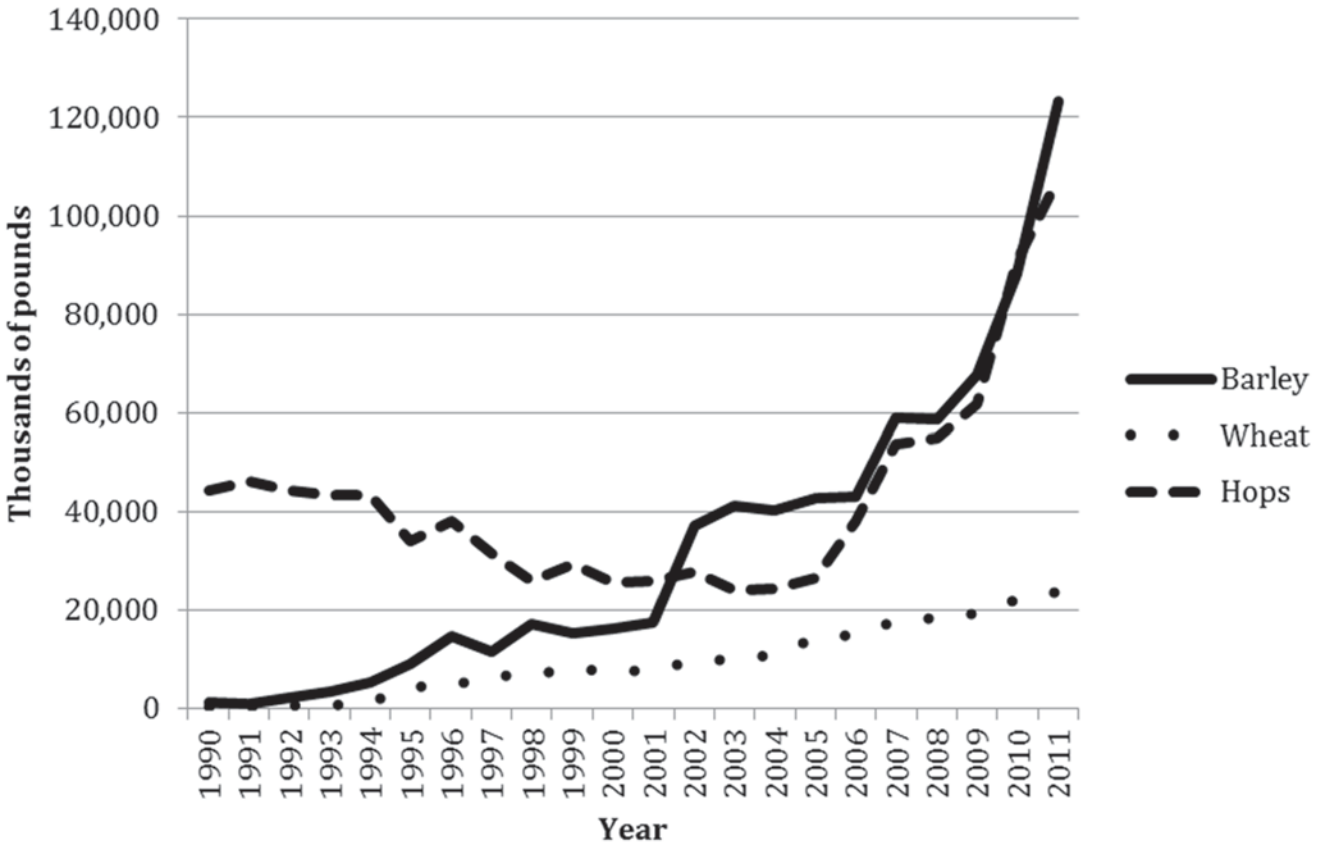

Fig. 13.5 Amount of "Quality" ingredients used in malt beverages, 1990–2011. (Source: The Beer Institute, Brewers Almanac, page 11)

eries. Shortridge (1996, p. 10) defines neo-localism as the "deliberate seeking out of regional lore and local attachment by residents (new and old) as a delayed reaction to the destruction in modern America of traditional bonds to community and family." A number of authors have argued that many craft breweries are utilizing naming and labeling to create such a sense of place and thereby a connection to the local community (Murray 2012; Schnell and Reese 2003; Flack 1997). Schnell and Reese (2003, p. 46; also, see Schnell and Reese's chapter in this volume) further suggest that the popularity of craft breweries derives "in part from the desire of people to break away from the smothering homogeneity of popular, national culture, and reestablish connections with local communities, settings and economies." Craft breweries are, thus, part of the larger "buy-local" movement that has grown in popularity in recent years, particularly with respect to the purchase of locally-grown food by "localvores" (Bond et al. 2006). The buy-local philosophy has extended to the brewers themselves. A survey of 52 US craft breweries conducted by the Food Processing Center at the University of Nebraska-Lincoln (2001) found that 59% were very or extremely interested in using locally-sourced grains in the making of their beer.

Consumer Demographics Craft beer is attractive to a discernible demographic. The typical consumer of craft beer is male, white, earns at least $75,000 per year, works in the service sector, and is college educated (Tremblay and Tremblay 2009, 2011; Clarke 2012; Murray and O'Neill 2012). Unlike mass-produced pale lager, craft beer is a normal good for which demand increases when incomes rise (Tremblay and Tremblay 2011). In his classic late nineteenth century work on the theory of wealth and status, Veblen (1899, p. 56) suggests that the consumption patterns of the "gentleman of leisure … undergoes a specialization as regards the quality of the good consumed. He consumes freely and of the best, in food, drink, narcotics …" This is consistent with Baginski and Bell's (2011, p. 175) characterization of craft brewed beer as a "high order prestige good" that is "often viewed as highbrow". Murray and O'Neill (2012, p. 900) refer to the craft beer consumer as "sophisticated" and "discerning". Tremblay and Tremblay (2011, p. 155) refer to the "prestige factor" of drinking craft beer. Silberberg (1985, p. 882) notes that as incomes increase consumers are likely to be focus on "the pleasurable aspects of eating". The demographics of the market may impact the geography of the industry as regions and locales whose demographic and economic characteris-

tics are attractive to craft brewers are more likely to possess a higher number of microbreweries and brewpubs (Baginski and Bell 2011).

The Geography of Brewing in the US

Despite the healthy body of literature on the US brewing industry, literature on the economic geography of the industry is relatively sparse. A state-level analysis by Florida (2012) found the number of craft breweries per 100,000 population higher in states with higher levels of education and higher levels of happiness and well-being, and lower in states where the population was politically more conservative, religious, smoked more, and had higher levels of obesity. Baginski and Bell (2011) analyzed the distribution of craft breweries across metropolitan areas of both the southeastern United States and the United States as a whole. They found that compared with other regions of the country, the southeastern United States has a smaller number of craft breweries both in absolute and per capita terms. The variability in the number of craft breweries per capita across southeastern metropolitan areas was correlated with higher costs of living, the existence of fewer health risks and greater provision of healthcare services, and a higher level of social tolerance. They also identified three metropolitan areas in the southeast—Asheville, North Carolina, Charlottesville, Virginia, and Myrtle Beach, South Carolina—that had a significantly larger number of craft breweries than predicted by their regression model. In the cases of Asheville and Charlottesville, Baginski and Bell (2011, p. 177) suggest that both of these metropolitan areas appear to have the "ideal urban attributes" (e.g. high quality of life and vibrant downtowns) that result in a "greater degree of resource partitioning". In the case of Myrtle Beach (and to some extent Asheville) a large tourist industry provides a market for the craft brew industry. Baginski and Bell (2011) extended their analysis to metropolitan areas across the entire United States. The three variables that were significant in their southeastern model were also significant in their national model. In addition, however, they found five other variables to be significant. In the national model the presence of craft breweries was also correlated with the presence of high quality educational services, a higher quality of life, higher degrees of wage inequality, less developed technological sectors, and a less vibrant arts and culture scene. The direction of the relationship with the three latter variables was not as hypothesized. It should be noted that both the southeastern and national models had low levels of explanation with r-square values of 0.186 and 0.292 respectively. From their analysis Baginski and Bell (2011) conclude that the diffusion of the craft brewing industry down the urban hierarchy in the southeast has occurred at a slower pace than in the country as a whole and reflects a lower level of demand for craft beers.

In an analysis of Portland, Oregon, Cortright (2002) suggests that the city's thriving craft brewing industry cannot be explained by traditional industrial location factors such as resource endowments and transportation cost advantages. Rather, the catalyst for the industry can be found in "distinctive local tastes" that manifested themselves in the large concentration of home brewers, higher than average consumption of imported beer, a spirit of eclectic entrepreneurism, and the example of a vibrant boutique wine industry (Cortright 2002, p. 4). Furthermore, the emergence of a large number of microbreweries in the Pacific Northwest may also be due to the prevalence of the hop-growing industry in the area (Morrisson 2011). These ideas are also supported by Tremblay and Tremblay (2009), who suggest that consumer preferences may vary by location as a result of geographic differences in customs, norms, or traditions.

Still, the economic geography of beer production across the entire US remains limited in the literature. Thus, we seek to fill this gap by examining state-level patterns of production, consumption, and location of the brewing industry in the US. The following section describes our methodology.

Data and Methodology

As noted, our empirical approach consists of three exercises. First, we examine the temporal changes in the aggregate production volume and the total number of brewing establishments for each state. Second, we examine state-level variation in total beer production, total craft-beer production, percent craft beer production, and per-capita craft beer production. Finally, we map the precise location of craft beer establishments to show the spatial and temporal distribution of active craft breweries in the US.

For our first exercise, we obtained state-level data on aggregate beer production and total number of brewing establishments from the Beer Institute's 2012 Brewers Almanac (Brewer's Almanac 2012). These data allowed us to chart the temporal change in total US barrels of beer produced in each state from 1967 to 2010, as well as the total number of active breweries in each state from 2004 to 2011. We present these results by both state (in table form) and region (using graphs). We group states into nine separate regions—Appa-

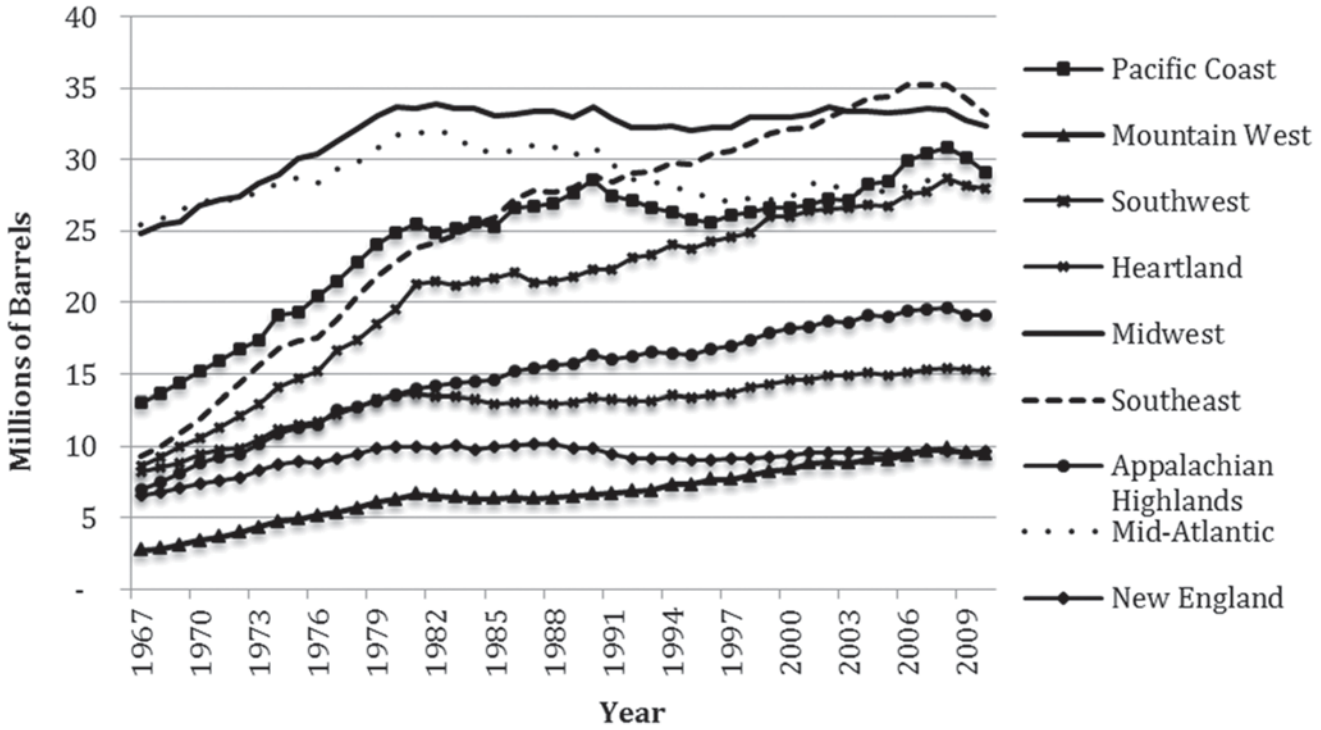

Fig. 13.6 Total beer production by region, 1967–2010. (Source: The Beer Institute, Brewers Almanac, page 26)

lachia, the Heartland, the Mid-Atlantic, the Midwest, New England, the Mountain West, the Pacific Coast, the Southeast, and the Southwest.[3]

For our second exercise, we utilized craft beer production data from the Brewers Association online database (available at www.brewersassociation.org). We combined these data with data from Brewer's Almanac to map state-level variation in total gallons of beer produced, total gallons of craft-beer produced, craft beer produced as a percentage of total state beer production, and per-capita production of craft beer in 2011.

Lastly, we obtained locational information on each craft-beer facility (microbreweries and brewpubs in the 2011) and combined this with year-of-establishment information to produce a series of maps that show the precise location of currently active breweries by decade of establishment. Specifically, we obtained the address, phone number, e-mail address, year of establishment, and production volumes for each microbrewery, brewpub and regional brewery, from multiple sources. Our first source was the Brewers Association website, which allowed for the search of breweries and brewpubs by state or by name. This returned a street address, phone number, web addresses, and production volumes for each listed establishment. Next, we utilized Brewery Database (www.brewerydb.com) to obtain zip codes and years of establishment for each establishment. This site allowed us to search breweries and brewpubs by name and to fill in missing data from the Brewers Association site. Next, we used the www.beerme.com to supplement year of establishment and barrel production figures. The above data sources allowed us to obtain the data for the vast majority of microbreweries and brewpubs. Data that were still missing were obtained from a variety of sources including the websites and Facebook pages of microbreweries and brewpubs, as well as media stories (usually in local newspapers) about microbreweries and brewpubs. As a last resort we contacted individual establishments via e-mail and telephone to obtain missing data. The resulting data tables were then formatted for mapping purposes in ArcMap. We used street addresses to geocode the microbreweries/brewpubs on a United States street network map. Address points were then created and spatial distributions were mapped per decade.

The Evolving Geography of American Brewing

Our first exercise consisted of examining the changes in total production and number of breweries over time. Figs. 13.6 and 13.7 show the temporal changes in total beer production from 1967–2010 and total number of breweries by region

[3] We base our state clustering procedure on the *United States History Map* (2007), which is a production of Thirteen/WNET New York.

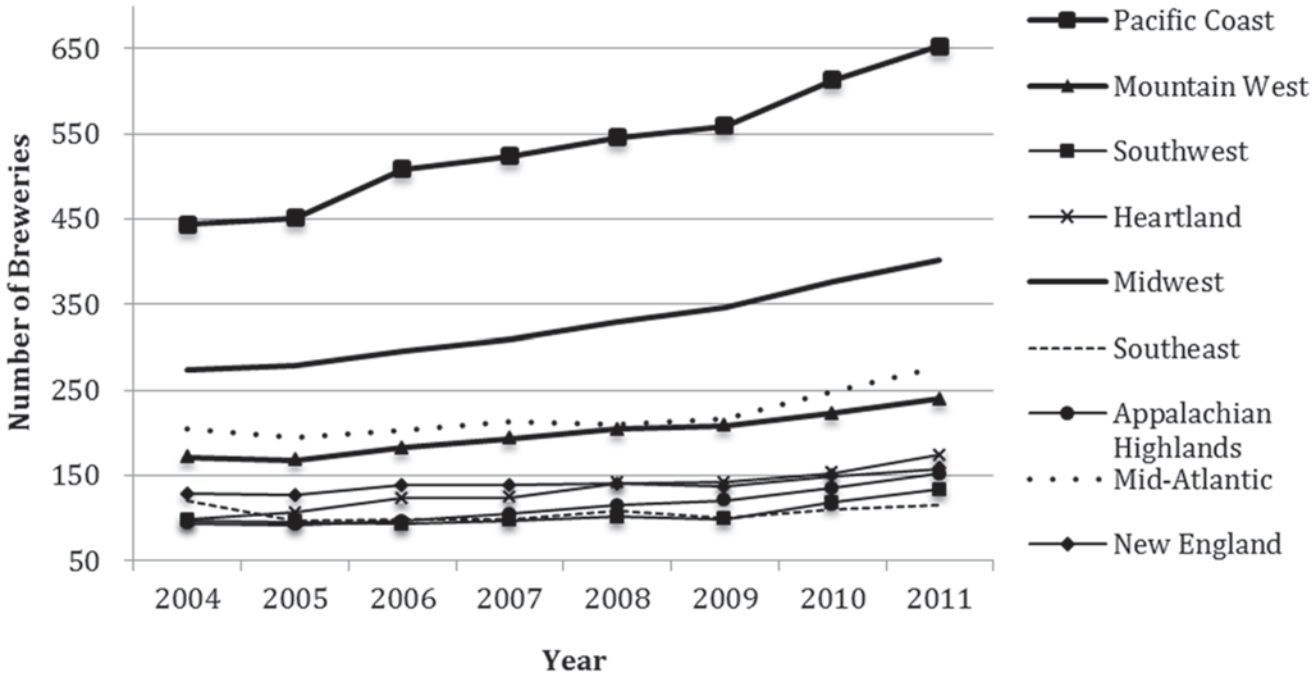

Fig. 13.7 Number of breweries by region, 2004–2011. (Source: The Beer Institute, Brewers Almanac, page 26)

from 2004–2010[4], respectively. Tables 13.1 and 13.2 show the respective figures by state. Our findings suggest that the nationwide trend of modest increase in aggregate production and substantial increase in the number of breweries has manifested itself in a rather uneven distribution across the country. We can generally classify region-level[5] production over time into three different growth categories (Fig. 13.6). First, the high-growth category is composed of three regions: the Pacific Coast, the Southeast, and the Southwest. Each of these three regions experienced high growth in production volumes between 1967 and 2010, having started the time period quite low, from 9–12 million barrels per year in 1967 to 27–33 million barrels per year in 2010. This represents an apparent increase in product of approximately 300 %. Second, medium growth in production volumes occurred in the Appalachian Highlands, the Heartland, the Mountain West, and New England. These regions also started the time period with relatively low production (between 3–8 million barrels), but experienced monotonic increases to the end of the time period (to between 10 and 19 million barrels). Lastly, the modest/flat growth category consists of the Mid-Atlantic and Midwest. Like the medium and high-growth regions, these states also experienced growth in total beer production between 1967 and 1980, which was followed by a period of little or no growth.

We disaggregate production by growth category and region in Table 13.1. In the high-growth regions, much of the increase was driven by four states: California's production grew from 10.1 to 22.1 million barrels; Texas' from 6.3 to 19.3 million barrels; Florida's from 3 to 12.7 million barrels; and Georgia's from 1.3 to 5.7 million barrels. In the medium growth regions, growth was primarily driven by two states: North Carolina's production increased from 1.4 to 6.1 million barrels and Virginia's from 2 to 5.1 million barrels. In the slow/no growth regions what little growth occurred was driven primarily by Ohio (6.2 to 8.3 million barrels) and Illinois (6.6 to 8.8 million barrels).

Like our analysis of regional-level production, we can generally classify regional-level growth of the number of breweries[6] into three different growth categories (Fig. 13.7). First, and similar to production volumes, high growth in the number of breweries occurred in the Pacific Coast region. Additionally, the Appalachian Highlands, The Heartland, and Midwest regions also experienced high growth in brewing establishments. The number of breweries in these regions grew by 47, 62, 84, and 46 %, respectively. Second are the middle-growth regions, where the number of breweries

[4] The time-frame displayed in Table 13.2 was determined by data availability in the Brewer's Almanac.

[5] States comprising each region are identified in Tables 13.1, 13.2, and 13.3.

[6] Due to data limitations, we are only able to analyze recent growth in the total number of breweries, from 2004–2011. As a result, Figs. 13.6 and 13.7 represent vastly different time periods.

Table 13.1 Number of barrels produced by state, 1967–2010. (Source: The Beer Institute, Brewers Almanac)

Region	1967	1970	1975	1980	1985	1990	1995	2000	2005	2010	% Growth
High Growth											
Southeast	*9,291,201*	*11,900,484*	*17,302,525*	*22,850,740*	*25,991,332*	*28,897,322*	*29,670,752*	*32,169,568*	*34,375,376*	*33,210,705*	*257*
Alabama	827,822	1,067,663	1,717,319	2,1154,313	2,420,441	2,613,617	2,820,439	3,028,088	3,207,971	3,301,083	
Arkansas	569,214	721,868	1,024,638	1,201,071	1,370,848	1,511,703	1,565,821	1,697,506	1,735,670	1,795,441	
Florida	3,152,572	4,039,606	6,470,054	9,240,708	10,617,253	11,703,197	11,603,750	12,235,618	14,084,997	12,714,196	
Georgia	1,339,546	1,873,828	2,558,231	3,431,052	4,127,607	4,668,307	4,086,825	5,711,652	5,815,383	5,765,443	
Louisiana	1,898,640	2,212,185	2,629,832	3,170,830	3,324,469	3,592,736	3,654,519	3,820,258	3,687,427	3,617,305	
Mississippi	680,323	924,140	1,258,503	1,544,576	1,735,635	1,931,322	2,084,650	2,316,864	2,331,674	2,319,457	
South Carolina	823,044	1,061,134	1,643,938	2,118,190	2,385,989	2,076,440	2,354,748	3,358,582	3,512,254	3,617,174	
Mountain West	*2,714,000*	*3,408,432*	*4,896,795*	*6,293,821*	*6,323,001*	*6,661,974*	*7,306,304*	*8,403,159*	*9,076,250*	*9,428,301*	*247*
Colorado	1,035,278	1,359,510	1,998,908	2,589,336	2,626,720	2,571,867	2,942,915	3,339,663	3,484,549	3,554,829	
Idaho	354,798	439,844	647,269	773,489	722,744	743,472	754,834	846,953	934764	1,016,510	
Montana	492,787	554,161	683,666	799,565	739,782	717,112	743,780	814751	900,780	971,947	
Nevada	346,589	430,345	641,022	050,071	1,076,433	1,557,800	1,604,179	2,066,301	2,353,411	2,337,629	
Utah	314,917	394,046	549,856	705,870	730,842	705,141	804,270	928,923	972,758	1,103,305	
Wyoming	169,631	221,576	375,174	474,590	426,480	366,582	366,318	406,568	429,988	444,081	
Southwest	*9,617,627*	*11,894,802*	*16,679,242*	*22,122,893*	*24,327,579*	*24,876,476*	*26,657,770*	*29,383,066*	*30,222,020*	*31,509,032*	*228*
Arizona	952,436	1,245,288	1,923,981	2,627,307	3,066,034	3,383,843	3,730,809	4,287,390	4,595,973	4,539,491	
New Mexico	490,048	602,033	901,262	1,144,965	1,344,533	1,330,644	1,438,317	1,575,664	1,557,761	1,575,516	
Colorado	1,035,278	1,359,510	1,998,908	2,589,336	2,626,720	2,571,867	2,942,915	3,339,663	3,484,549	3,565,994	
Oklahama	829,980	1,070,982	1,476,460	1,930,287	1,922,437	1,994,090	2,111,738	2,213,729	2,268,257	2,466,610	
Texas	6,309,885	7,616,939	10,378,031	13,830,998	15,367,855	15,596,032	10,383,991	17,960,620	18,315,480	19,301,421	
Medium Growth											
Appalachian Highlands	*7,008,600*	*8,850,778*	*11,354,904*	*13,597,787*	*14,638,978*	*16,338,801*	*16,387,437*	*18,246,285*	*18,997,142*	*19,077,695*	*172*
Kentucky	1,392,514	1,583,194	1,942,907	2,189,037	2,270,089	2,388,004	2,355,269	2,517,894	2,555,739	2,507,991	
Marth Carolina	1,446,561	1,915,663	2,845,519	3,680,615	3,974,657	4,473,454	4,753,7S8	5,590,081	5,958,000	6,109,484	
Tennessee	1,393,208	1,814,187	2,511,299	2,863,139	3,045,632	3,438,345	3,620,512	4,001,309	4,055,232	3,892,794	
Virginia	2,078,238	2,727,518	3,126,316	3,763,737	4,119,802	4,785,500	4,426,756	4,862,375	5,063,940	5,190,586	
West Virginia	698,079	810,216	928,363	1,101,259	1,228,798	1,253,438	1,231,142	1,274,626	1,359,231	1,376,841	
PacificCoast	*13,509,389*	*15,815,858*	*20,321,579*	*26,080,492*	*26,744,095*	*30,079,367*	*27,297,009*	*28,065,516*	*29,929,169*	*30,559,763*	*126*
Alaska	133,624	173,277	286,459	333,083	461,254	471,201	477,539	466,229	493,34 0	454,629	
California	10,110,919	11,730,448	15,045,832	19,538,050	20,374,349	22,893,592	20,08,044	20,551,239	21,758,737	22,169,199	
Hawaii	337,700	440,000	703,000	891,000	941,761	1,047,404	964,595	942,053	988,526	985,000	
Oregon	1,124,917	1,316,054	1,633,866	2,046,810	1,912,601	2,148,886	2,230,889	2,391,559	2,657,010	2,801,298	
Washington	1,802,229	2,156,079	2,652,422	3,270,749	3,054,070	3,518,284	3,565,042	3,714,436	4,030,955	4,149,637	
The Heartland	*7,332,062*	*8,400,117*	*10,350,999*	*12,146,019*	*11,666,459*	*12,040,777*	*12,059,662*	*13,186,580*	*13,462,920*	*13,736,921*	*87*
Iowa	1,445,053	1,622,377	2,019,396	2,317,271	2,128,498	2,114,019	2,081,731	2,298,817	2,392,252	2,496,039	
Kansas	819,385	1,027,487	1,435,054	1,655,966	1,591,637	1,575,068	1,580,259	1,768,782	1,836,845	1,886,675	
Minnesota	1,941,918	2,235,089	2,790,318	3,209,514	3,110,799	3,269,470	3,283,822	3,588,539	3,519,542	3,530,241	

Table 13.1 (continued)

Region	1967	1970	1975	1980	1985	1990	1995	2000	2005	2010	% Growth
Missouri	2,504,326	2,804,508	3,219,165	3,904,116	3,847,366	4,008,145	4,029,618	4,333,699	4,393,560	4,454,255	
North Dakota	341,832	388,313	48U,42K	558,914	510,735	549,071	527,177	572,588	643,784	647,547	
South Dakota	279,548	322,343	406,638	500,238	477,424	525,004	557,055	624,155	676,937	722,163	
Slow/No Growth											
New England	*6,589,487*	*7,343,880*	*8,906,517*	*9,966,364*	*9,956,483*	*9,873,379*	*9,034,132*	*9,322,147*	*9,417,949*	*9,616,155*	*46*
Connecticut	1,529,698	1,602,579	1,814,020	1,911,329	2,131,896	2,104,449	1,862,562	1,854,550	1,850,876	1,863,545	
Maine	549,128	644,534	835,958	839,745	833,153	874,938	844,848	882,900	987,454	1,036,236	
Massachusetts	3,109,319	3,472,743	4,294,783	4,978,869	4,579,881	4,465,982	4,041,187	4,166,772	4,110,770	4,121,871	
New Hampshire	511,390	647,697	865,451	1,012,496	1,150,351	1,176,437	1,118,019	1,270,415	1,313,267	1,386,944	
Rhode Island	614,272	656,780	731,536	808,946	802,597	777,835	707,627	707,004	690,237	679,090	
Vermont	275,680	319,547	364,769	414,979	458,605	473,738	429,889	440,506	465,345	528,469	
Mid-West	*25,702,729*	*27,764,273*	*31,266,289*	*35,095,487*	*34,307,552*	*34,988,495*	*33,341,739*	*34,387,710*	*34,703,497*	*33,867,032*	*32*
Illinois	6,651,330	7,102,911	8,022,413	9,206,604	9,043,899	9,486,982	8,853,579	9,038,323	9,063,267	8,842,590	
Indiana	2,487,132	2,711,024	3,018,398	3,874,415	3,894,918	4,008,507	3,767,912	3,954,209	3,998,855	4,005,194	
Michigan	5,804,709	6,256,847	7,043,065	6,939,045	6,760,524	7,041,663	6,625,566	6,761,561	6,700,174	6,315,663	
Nebraska	874,567	1,005,899	1,175,804	1,396,859	1,271,896	1,280,624	1,271,740	1,399,454	1,427,389	1,484,112	
Ohio	6,257,706	6,768,702	7,285,026	8,477,433	8,384,943	8,354,191	8,203,797	8,493,144	8,584,283	8,386,105	
Wisconsin	3,627,285	3,918,890	4,720,983	5,201,131	4,951,372	4,816,526	4,619,145	4,741,019	4,929,529	4,833,368	
Mid-Atlantic	*25,455,416*	*27,004,707*	*28,710,876*	*31,709,301*	*30,545,465*	*30,889,755*	*27,592,072*	*27,319,854*	*27,820,220*	*27,973,243*	*10*
Delaware	301,858	331,077	391,140	490,368	526,566	555,335	567,841	617,937	707,143	735,442	
Maryland	2,364,883	2,664,569	3,060,055	3,422,178	3,388,029	3,358,317	3,077,410	3,153,355	3,312,453	3,246,845	
New Jersey	4,208,441	4,462,008	4,712,090	5,235,870	5,210,954	5,240,440	4,803,697	4,673,887	4,822,569	4,758,293	
New York	11,050,565	11,536,043	11,708,978	12,610,539	11,910,116	11,856,992	10,440,066	10,164,810	10,308,722	10,336,562	
Pennsylvania	7,529,669	8,011,010	8,838,613	9,950,346	9,509,800	9,878,671	8,703,058	8,709,865	8,579,334	8,894,102	
TOTAL	*178,131,103*	*201,234,462*	*241,633,769*	*284,714,084*	*289,522,366*	*300,236,636*	*294,428,984*	*312,667,170*	*321,775,370*	*323,627,465*	*82*

Table 13.2 Number of active breweries by state, 2004–2011. (Source: The Beer Institute, Brewers Almanac)

Region	2004	2005	2006	2007	2008	2009	2010	2011	% Growth
High growth									
The Heartland	*85*	*91*	*107*	*107*	*124*	*124*	*136*	*156*	*84*
Iowa	16	16	17	19	20	21	24	29	
Kansas	10	11	14	14	15	15	15	17	
Minnesota	26	26	30	28	41	41	39	49	
Missouri	25	29	37	38	41	41	51	51	
North Dakota	4	5	3	2	1	1	3	3	
South Dakota	4	4	6	6	6	5	6	7	
Appalachian Highlands	*94*	*92*	*96*	*105*	*115*	*121*	*135*	*152*	*62*
Kentucky	9	9	9	11	11	13	12	13	
North Carolina	38	38	40	43	44	46	54	63	
Tennessee	18	13	14	19	19	19	20	27	
Virginia	25	28	29	28	37	37	42	44	
West Virginia	4	4	4	4	4	6	7	5	
Pacific Coast	*444*	*451*	*509*	*524*	*546*	*559*	*613*	*653*	*47*
Alaska	12	11	15	16	16	17	20	22	
California	256	253	283	293	307	305	318	332	
Hawaii	8	8	11	10	10	9	8	8	
Oregon	83	86	94	96	104	105	119	130	
Washington	85	93	106	109	109	123	148	161	
Mid-West	*287*	*293*	*312*	*326*	*346*	*365*	*391*	*420*	*46*
Illinois	39	38	43	42	45	52	55	55	
Indiana	21	25	25	29	32	38	43	52	
Michigan	73	78	91	93	93	96	103	114	
Nebraska	13	15	16	17	17	18	15	18	
Ohio	49	45	49	51	60	60	63	66	
Wisconsin	92	92	88	94	99	101	112	115	
Medium growth									
Southwest	*187*	*187*	*198*	*206*	*214*	*210*	*242*	*266*	*42*
Arizona	33	27	28	31	31	31	31	35	
New Mexico	20	22	24	22	21	21	28	28	
Colorado	90	92	105	109	113	111	124	133	
Oklahama	7	7	7	7	9	10	10	9	
Texas	37	39	34	37	40	37	49	61	
Mountain West	*171*	*168*	*182*	*193*	*204*	*208*	*223*	*240*	*40*
Colorado	90	92	105	109	113	111	124	133	
Idaho	17	16	17	17	20	21	21	27	
Montana	21	19	21	26	29	30	30	32	
Nevada	17	14	16	15	16	17	18	18	
Utah	14	14	13	13	13	15	16	16	
Wyoming	12	13	10	13	13	14	14	14	
Mid-Atlantic	*204*	*195*	*203*	*213*	*209*	*217*	*249*	*277*	*36*
Delaware	9	7	8	8	8	10	9	9	
Maryland	25	24	21	22	22	23	22	24	
New Jersey	21	22	20	21	21	20	24	26	
New York	79	73	79	75	73	76	89	101	
Pennsylvania	70	69	75	87	85	88	105	117	
Slow/No growth									
New England	*128*	*127*	*138*	*138*	*140*	*137*	*149*	*158*	*23*
Connecticut	14	15	18	17	19	18	20	17	
Maine	37	41	40	40	39	38	39	44	
Massachusetts	37	34	40	42	41	40	43	46	
New Hampshire	13	13	14	14	15	16	17	18	
Rhode Island	5	5	5	5	5	5	5	5	

Table 13.2 (continued)

Region	2004	2005	2006	2007	2008	2009	2010	2011	% Growth
Vermont	22	19	21	20	21	20	25	28	
Southeast	*120*	*96*	*98*	*99*	*108*	*100*	*111*	*115*	−4
Alabama	4	5	5	6	6	6	7	7	
Arkansas	4	4	5	4	4	4	5	7	
Florida	63	43	48	47	57	47	52	52	
Georgia	23	19	19	20	19	22	22	24	
Louisiana	8	10	6	5	6	6	9	8	
Mississippi	2	2	1	1	2	1	2	2	
South Carolina	16	13	14	16	14	14	15	15	
Total	*1,720*	*1,700*	*1,843*	*1,911*	*2,006*	*2,041*	*2,251*	*2,437*	*42*

Table 13.3 Active craft breweries by state and decade of establishment. (Source: Brewers Association)

State	1970s	1980s	1990s	2000s
Alabama	0	0	0	5
Alaska	1	1	7	18
Arizona	0	1	11	29
Arkansas	0	0	1	6
California	6	20	93	215
Colorado	1	5	40	107
Connecticut	1	1	6	12
Delaware	0	0	4	7
Florida	1	2	14	37
Georgia	0	0	5	13
Hawaii	0	0	1	4
Idaho	1	4	11	22
Illinois	1	1	17	48
Indiana	1	2	12	40
Iowa	0	2	6	23
Kansas	0	2	8	16
Kentucky	0	0	2	10
Louisiana	0	0	1	7
Maine	1	2	14	24
Maryland	0	0	8	16
Massachusetts	0	2	12	32
Michigan	3	5	41	93
Minnesota	0	1	10	30
Mississippi	0	0	0	2
Missouri	0	3	10	39
Montana	0	1	12	28
Nebraska	1	1	9	18
Nevada	0	0	9	16
New Hampshire	1	1	8	14
New Jersey	0	1	14	23
New Mexico	1	1	11	23
New York	0	1	32	62
North Carolina	0	1	13	46
North Dakota	0	0	0	2
Ohio	1	2	20	39
Oklahoma	0	0	4	9
Oregon	0	1	34	90
Pennsylvania	3	4	19	81
Rhode Island	0	1	2	6
South Carolina	0	0	10	16
South Dakota	0	0	2	5
Tennessee	0	0	6	20
Texas	1	2	13	52
Utah	1	3	8	14
Vermont	0	1	7	16
Virginia	0	1	11	34
Washington	3	6	39	110
West Virginia	0	0	2	5
Wisconsin	2	3	30	67
Wyoming	0	0	6	13

in the Southwest, Mid-Atlantic and Mountain West regions grew by 42, 40, and 36 %, respectively. Last, the modest/flat growth regions consist of New England and the Southeast, which grew by 23 and −4 %, respectively.

In Table 13.2, we disaggregate the number of breweries by growth category and region. For the high-growth regions, much of the increase in breweries was driven by three states: Indiana's brewing establishments increased by 148 %; Missouri's establishments increased by 104 % and Washington's increased by 89 %. In the medium-growth regions, growth was driven primarily by Pennsylvania (67 %) and Texas (65 %). Growth in the modest/flat growth regions was primarily in Alabama and Arkansas (both grew by 75 %).

Moving on to our second exercise, Figs. 13.8–13.11 show state-level variation in the production of craft beer across the country in 2011. Figures 13.10 and 13.11 were produced using a manual classification scheme, with natural breaks being used as a base for the created classes. Figure 13.8 shows total beer production by state, and the map shows states such as California and Texas leading the way with over 400 million gallons of beer produced in 2011 respectively. Other states that have high overall beer production levels include Illinois, Ohio, Pennsylvania, and New York. Figure 13.9 shows total craft beer production by state, and the

Fig. 13.8 Total gallons of beer produced, 2011. (Source: The Beer Institute, Brewers Almanac)

results closely mirror total beer production in Table 13.1. It appears aggregate levels of craft beer production follow two major trends across states: higher production in the most populated states (California, New York, and Texas) and in states with historically high levels of beer production (Colorado, Missouri, Wisconsin, and Pennsylvania).

However, when we look at craft beer production per-capita (normalized by state population), a slightly different story emerges. Figures 13.10 and 13.11 show the amount of craft beer produced as a percent of total beer production and per-capita production of craft beer, respectively. In these figures the most populated states (California, Texas, and New York) drop to relatively lower levels of production, while a clear concentration of production arises in stereotypically "beer" states, such as Colorado, Oregon, Massachusetts, and Pennsylvania. Surprisingly, the two states home to the two largest traditional breweries—Wisconsin (Miller) and Missouri (Anheuser-Busch)—are also home to a relatively high level of craft beer production.

Our third exercise yields perhaps the most intriguing findings. While the previous two exercises show that growth in both aggregate and craft beer production has manifested unevenly over space, our examination of brewpub and microbrewery location for the years of 1980, 1990, 2000, and 2011, uncovers an increasing propensity for breweries to establish in non-major markets. These maps were also generated using a manual classification scheme, using natural breaks as the base for the created classes. Figure 13.12 shows that up until 1980, the few craft beer establishments in the United States generally located in major urban centers. The rust belt cities of Pittsburgh, Cincinnati, Milwaukee, Detroit, and Chicago where home to early craft brew establishments. On the west

Fig. 13.9 Total gallons of craft beer produced, 2011. (Source: The Beer Institute, Brewers Almanac)

coast, Seattle, the San Francisco Bay Area, and Southern California were also home to concentrations of craft breweries. There was almost no representation in the southern states. Resort areas throughout the United States, such as the Rocky Mountains, northern Michigan, and New England were also early locations for craft brewing.

Figure 13.13 shows that as of 1990, established clusters appear to have developed on the west coast. The San Francisco Bay Area becomes the forerunner of the craft brewing industry in the United States, with other west coast metro areas such as Seattle and Los Angeles incubating craft brewing clusters. A swath of establishments starts to develop through the Rocky Mountains, with Denver anchoring most of the breweries in this region. Growth in the Midwest appears to be sporadic, but spread across the region and close to or within major cities. On the East Coast, craft brewing in New England seems to be following the megalopolis corridor, but with establishments popping up in the resort areas of Vermont, New Hampshire, and Maine. Again craft breweries in the south appear to lag behind the rest of the country.

Figure 13.14 shows that between 1990 and 2000, the craft brewing industry grew significantly. Metro areas all across the country experienced a large increase in the amount of craft brewing establishments during this time period, specifically Seattle, Portland, San Francisco, Los Angeles, Denver, Chicago, Detroit, and New York. These locales experienced a doubling or tripling of firms from the previous decade. A developing trend in the industry shows that craft breweries seem to correspond with population densities; the higher the population density the larger the presence of craft brewing establishments. Also, resort areas seem to have a propensity for craft breweries. Regions such as the Rocky Mountains, the Cascades, and Northern Michigan all experienced a significant increase in craft breweries during this period.

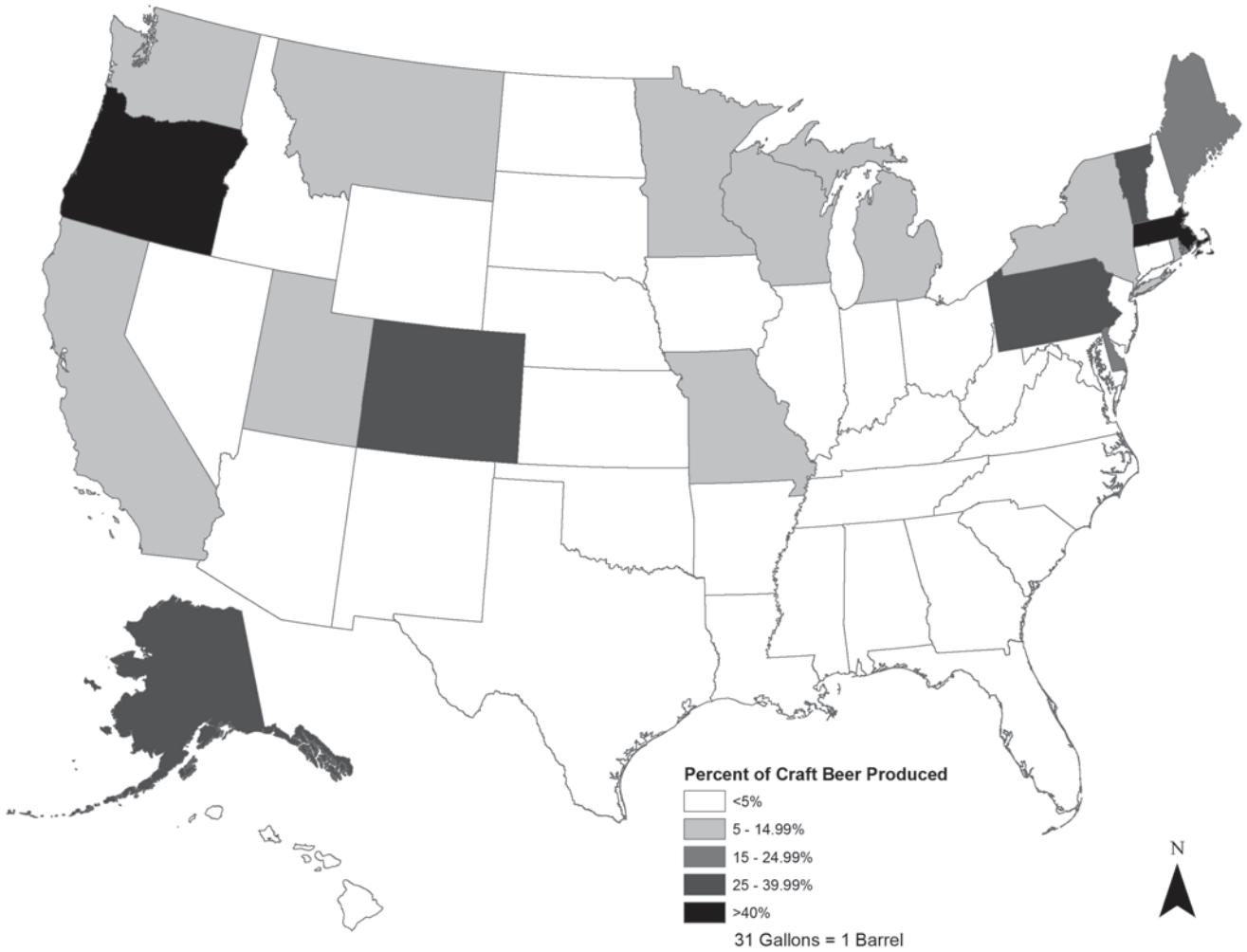

Fig. 13.10 Craft beer produced as a percent of state total, 2011. (Source: The Beer Institute, Brewers Almanac)

Also during this time, portions of the southern United States began to experience growth in the industry. Areas in Virginia, North Carolina, South Carolina, Georgia, and Florida ushered in multiple craft brewing establishments in the 1990s. Major cities such as Atlanta, Jacksonville, Tampa, and Miami became the few major cities in the south to experience growth in the craft brewing industry. The regions around Asheville and Winston-Salem in North Carolina begin to establish a cluster of craft establishments. The spatial story runs parallel with that of the coastal regions in the south. The coastal, resort areas of the south appear to be trying to catch up with the rest of the United States. The story for Alabama, Mississippi, Louisiana, southern Georgia, and the panhandle of Florida remains the same.

Figure 13.15 shows that as of 2011, the industry experienced exponential growth during the previous 10 years. Craft brewery establishments throughout the country are located not only around densely populated areas, but also increasingly into suburban, exurban, and even rural areas. Microbreweries are present in every consumer market in the United States with clear concentration and clusters around the major population centers. By 2011, only half of all craft brewery establishments in United States during this time were located within 50 miles of cities with a population of 315,000 people or greater. While the major clusters centered around Seattle, Portland, San Francisco, Los Angeles, San Diego, Denver, Chicago, Detroit, and the East Coast, it is of perhaps greater interest that significant expansion of craft breweries occurred in non-traditional markets in rural Wyoming, Montana, Nebraska, Tennessee, and Kentucky. Twenty years earlier, these areas had limited or no craft brewing establishments.

Furthermore, resort areas such as the Cascades Range, the Rocky Mountains, Northern Michigan, the Northern Appalachians, and the Piedmont of the Appalachians are also hotbeds for the craft brewing industry. There is a clear

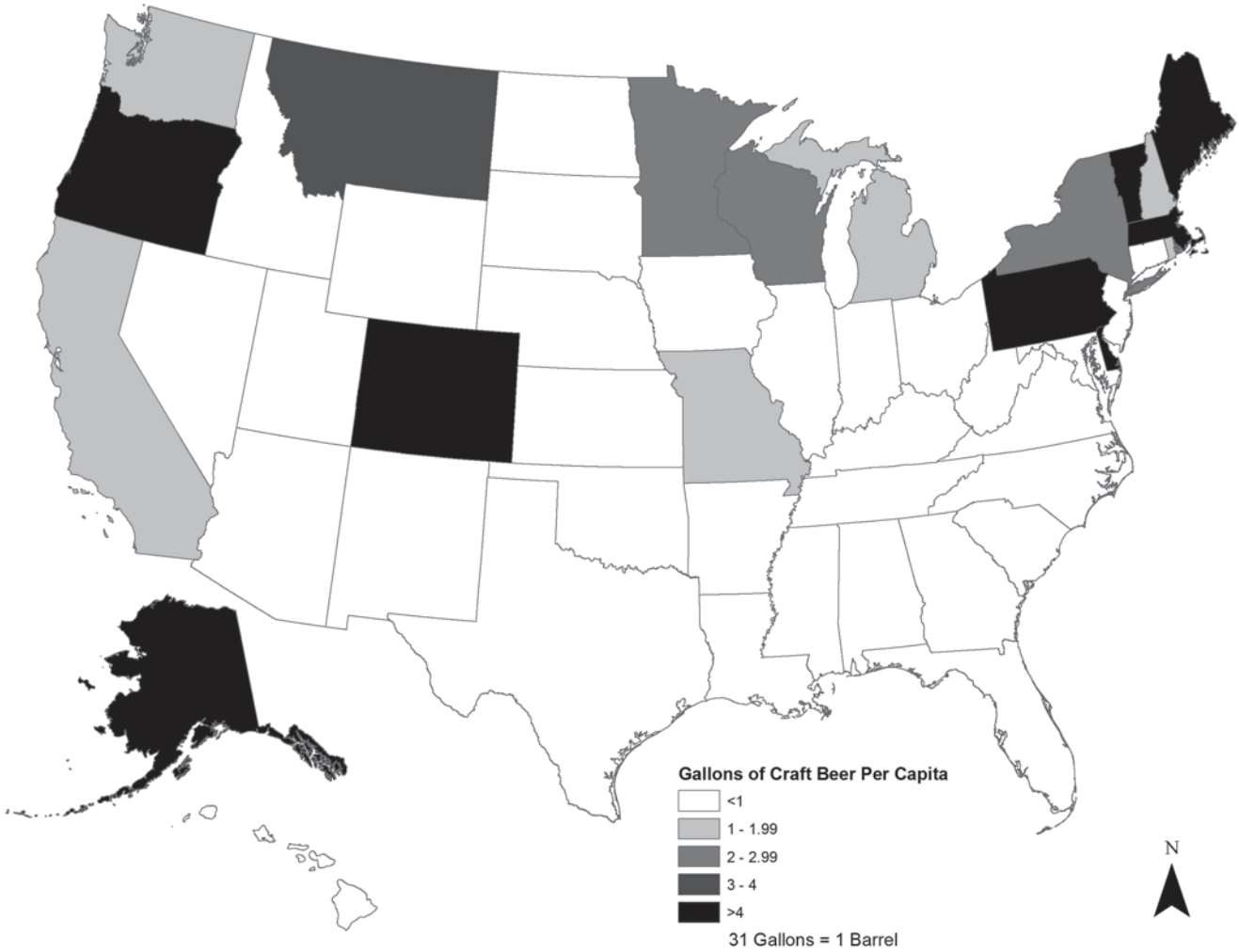

Fig. 13.11 Gallons of craft beer produced per capita, 2011. (Source: The Beer Institute, Brewers Almanac)

distribution of establishments through the Rocky Mountains stretching from Seattle, through Denver, and into Albuquerque. The Cascade corridor between Sacramento and Portland also displays a propensity for craft brewing establishments. The Northern Appalachians in Vermont, New Hampshire, and Maine is a developing hotspot for the industry as well.

Areas with lower population densities such as Arkansas, North Dakota, South Dakota, and Nevada have lower rates of observable craft brewing establishments. Other visibly neglected locations include Mississippi and Alabama in the south. This can be explained by the fact that up until 2009, beer with an alcohol content greater than 6 % was prohibited in Alabama (Alabama House Bill 631). Similar restrictions applied in Mississippi until April of 2012, when the Craft Beer Bill was signed by Gov. Phil Bryant, allowing for the possession and consumption of beer with alcohol content greater than 5 % (Nave 2012). Another observed explanation for the lack of craft breweries in the Dakotas and regions of the south is the social conservative nature of the areas, who might view such establishments as less desirable (Baginski and Bell 2011).

Conclusion

In this chapter, our goal was to spatially examine the economic and locational characteristics of the brewing industry in the United States. Our review of background data and scholarly literature revealed that much of the recent growth in the industry was in the craft beer sector. We developed a series of three empirical exercises to analyze the spatial variation in production and location of both aggregate brew-

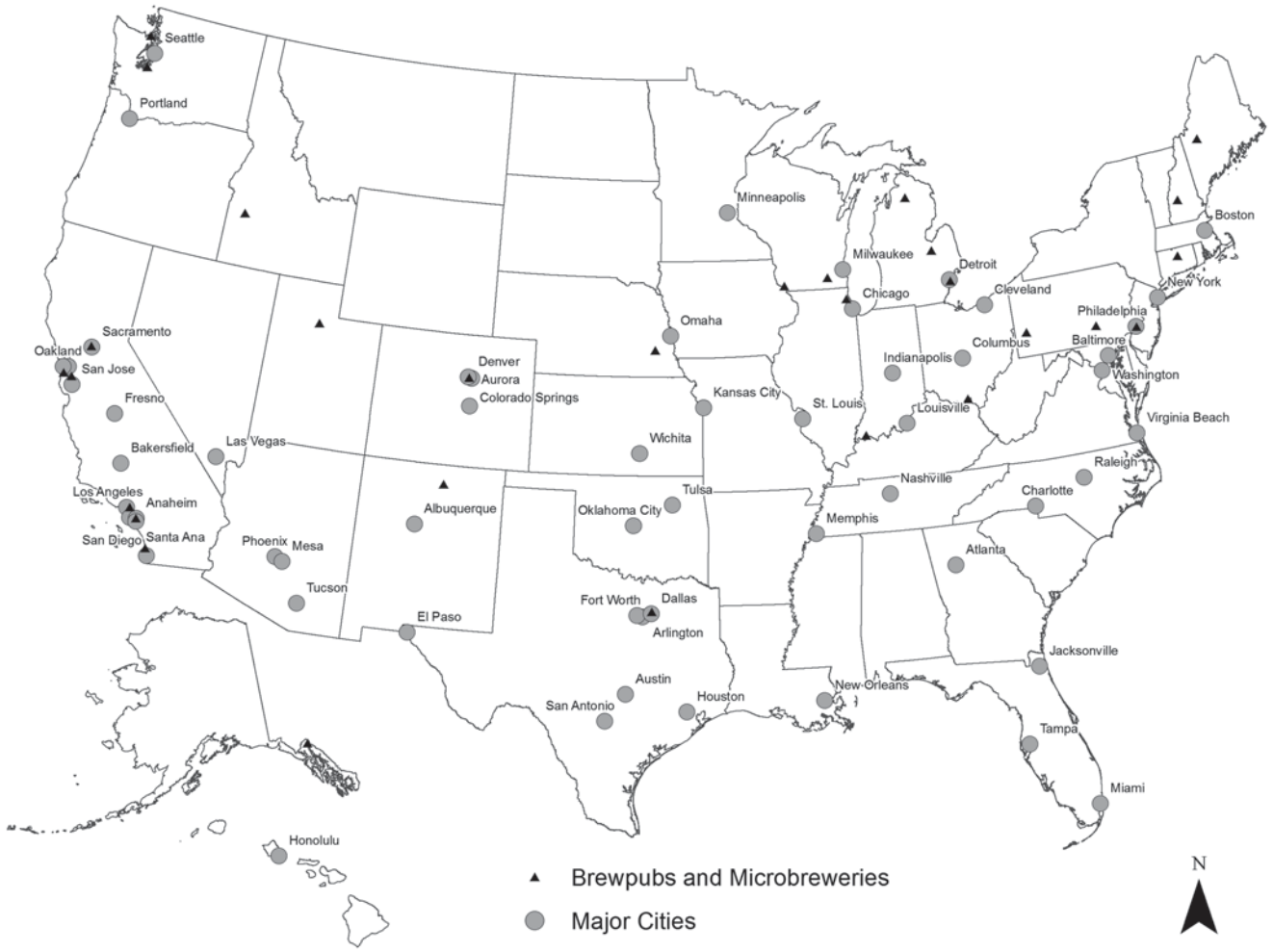

Fig. 13.12 Location of Microbreweries and Brewpubs, 1980. (Source: Brewery Database.com)

ing and craft brewing activity in the US. First, we conducted a broad level exercise by examining regional-level growth in both aggregate production volume and the number of brewing establishments. Second, we employed a spatially disaggregated analysis of the craft brewing industry by examining state-level production of craft beer in 2011. And last, we carried out a point-specific analysis of the location of craft breweries in the U.S. over the past 30 years.

Our results are threefold. First, our broad-level analysis of the US brewing industry indicates that national trends in aggregate beer production and brewery openings have manifested themselves unevenly between regions. While the traditionally high output brewing regions of the Midwest and Mid-Atlantic have experienced slow growth in production volume over the past 40 years, they have paradoxically experienced relatively solid growth in the number of brewing establishments over the past 8 years. Conversely, the Pacific Coast experienced high growth in both beer production and the number of brewing establishments. Regions in the Southeast and Southwest also experienced high growth in beer production, but little growth in the total number of brewing establishments.

Second, our analysis of state-level craft beer production also reveals a spatially uneven distribution across the country. When looking at production levels of craft beer, we find that the largest concentrations of brewing activity are primarily in states that are highly populated, such as California, New York, Pennsylvania, and Texas, or in states with a long-history of brewing culture—Colorado, Massachusetts, Missouri, Oregon, and Wisconsin. However, when we examine standardized measures of craft beer production, such as production per capita and percentage of total beer production, the states with established brewing culture

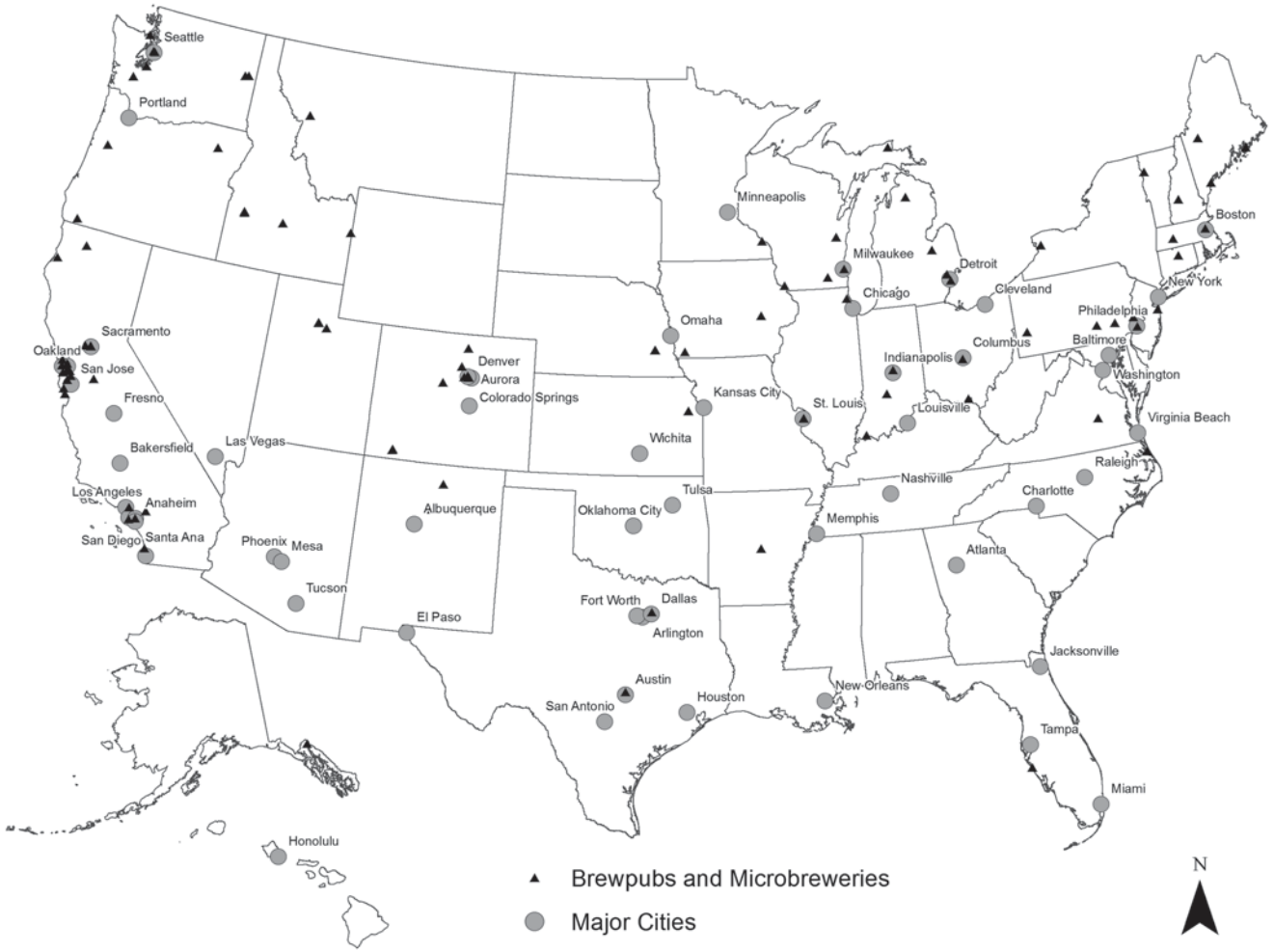

Fig. 13.13 Location of Microbreweries and Brewpubs, 1990. (Source: Brewery Database.com)

dominate and states with large populations become less important.

Last, our point-specific analysis of the evolution of craft beer establishments in the US reveals a much different spatial pattern than our first two analyses. While the initial spatial distribution of craft breweries in the 1980 and 1990 was also uneven—they tended to primarily locate in or near major urban centers—craft breweries have since spread to exurban and rural areas. Our series of maps show a clear decentralization of such establishments between 1980 and 2011. While urban centers still harbor a distinct concentration of craft breweries, it is perhaps the expansion into less populated and more socially conservative areas in Alabama, Idaho, Louisiana Nebraska, Mississippi, and Wyoming that is most intriguing.

So what do these findings mean for the future of the US brewing industry? First, it appears the craft beer industry will continue to be dynamic and fast changing. For example, 250 new microbreweries and brewpubs opened up in 2011, while only 37 closed down (Brewers Association 2013). According to Metzger (2013) there are currently over 1,000 new microbreweries and brewpubs that are in the planning stages. There are 1,240 microbreweries and brewpubs listed as being in the planning stages on the The Brewers Association website. However, the industry will have to overcome the challenges associated with "lock-in" and "switching costs" if craft brewers are to make significant inroads in a market currently dominated by traditional brewers. Choi and Stack (2005, p. 86) suggest that "continued consumer behavior shifts may yet change the standard for American beer, but that this will most likely be a slow and gradual process". In 2012 Charlie Papazian, President of the Brewers Association, predicted that by 2017 craft beers will account for ten percent of all beer sold in the

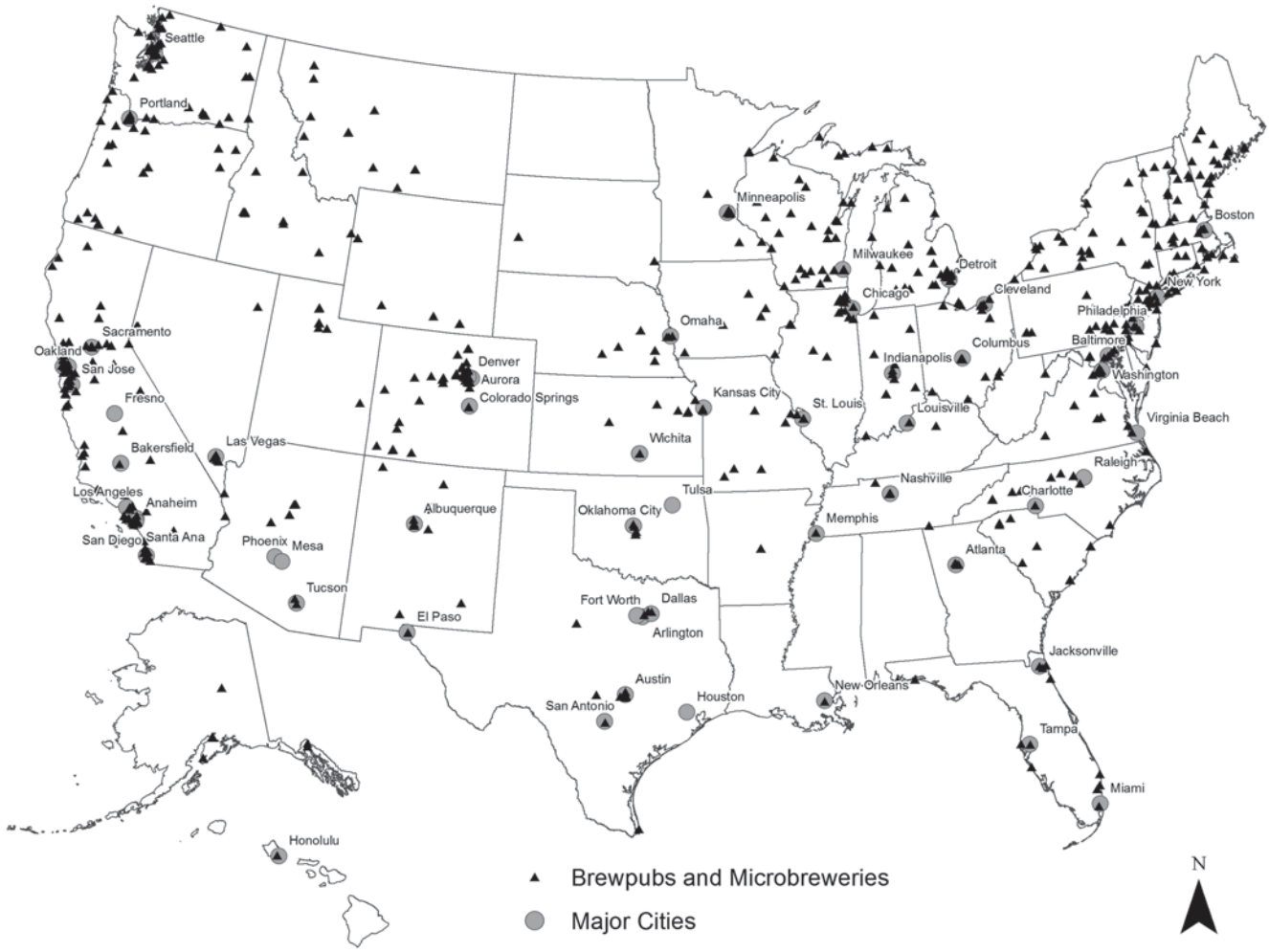

Fig. 13.14 Location of Microbreweries and Brewpubs, 2000. (Source: Brewery Database.com)

United States (Rotunno 2012). The traditional brewers are aware of the economic and marketing challenges they face from the craft segment of their industry. In response, several of the major breweries have produced their own line of beers that, to the uneducated consumer, have the appearance of a craft beer. Examples include Blue Moon (brewed by Tenth and Blake, part of Coors) and Shock Top (brewed by Anheuser-Busch) (Wilson 2012). These so called 'crafty beers' as some have labeled them, do not even mention the name of the traditional brewer on the label (Brewers Association 2013).Traditional brewers have also responded by purchasing established craft breweries. For example, Anheuser-Busch purchased Chicago-based Goose Island in 2011 for a reported $38.8 million (CBS Chicago 2011). The extent to which these recent developments will become a discernible trend and what their impact on the industry might be is difficult to tell.

Future growth of the industry will display distinct spatial patterns. With over 1,000 brewpubs and microbreweries in the planning stages (Brewer's Almanac 2012), the future economic geography of the brewing industry is likely to take two forms: (1) states currently dominant in the craft brewing industry will continue to be dominant, and (2) expansion will occur into states that have traditionally had fewer brewing establishments (especially in the south). Using data from the Brewers Association, we were able to map the potential growth of the industry over the next 3 to 5 years by using breweries-in-planning information for each state (Fig. 13.16). The Pacific Coast will continue to display growth in craft brewing establishments. California, the epicenter of craft brewing in the Unites States, will add over 150 craft brewing establishments in the near future. Washington and Oregon will also be adding craft beer establishments, putting the region at the forefront of the craft brewing movement.

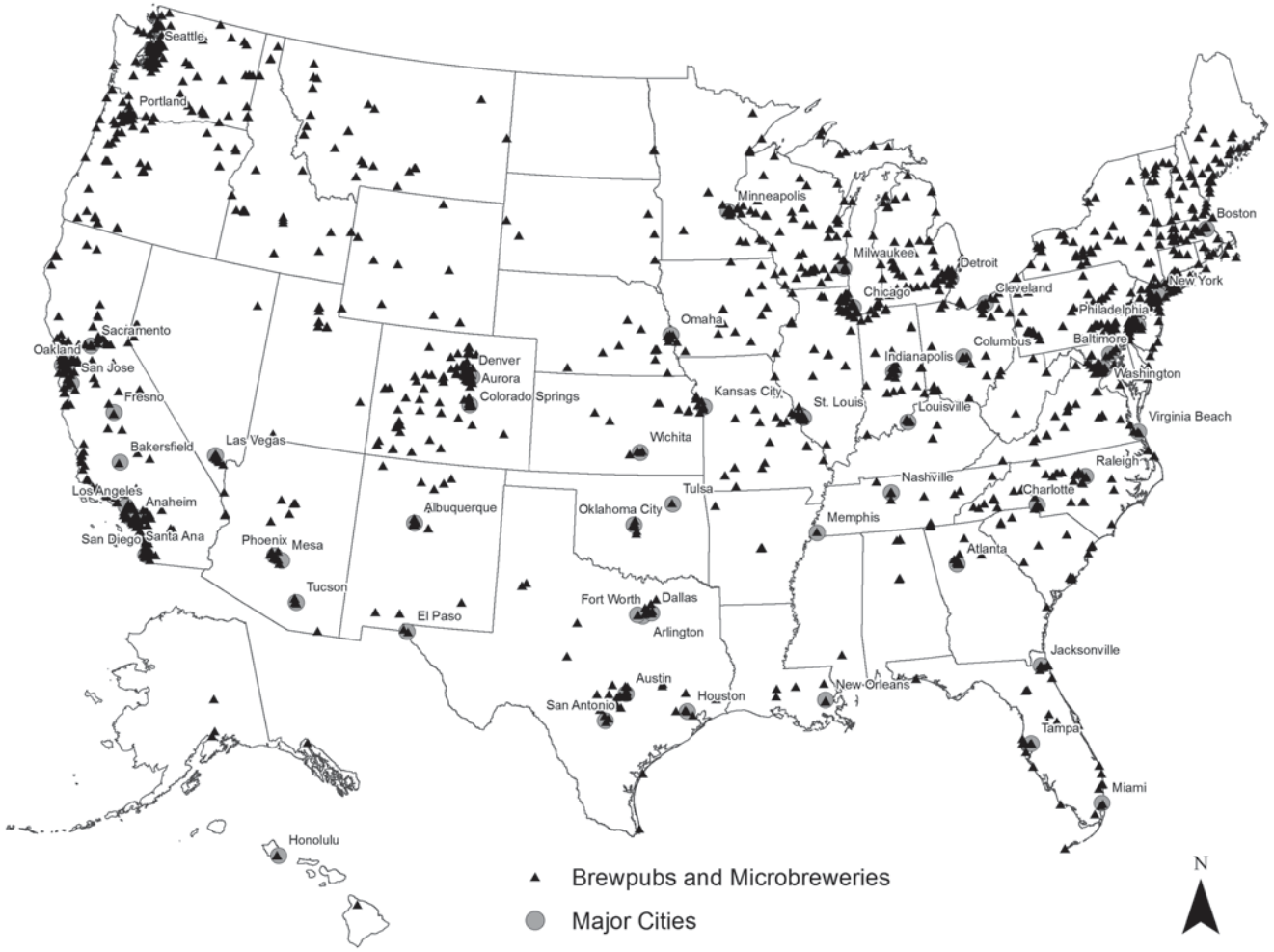

Fig. 13.15 Location of Microbreweries and Brewpubs, 2011. (Source: Brewery Database.com)

This indicates that the industry has yet to reach saturation in this region. The Midwest will display steady growth, with Illinois adding 70 craft beer establishments in the next couple of years. This suggests that the population density and purchasing power of the Chicagoland market is the driving force of the industry in this region. The coastal Atlantic south will continue to catch up with the rest of the United States, with Florida setting the pace. Though the coastal areas of the south show future growth, states such as Mississippi, Alabama, Louisiana, Arkansas, Tennessee and Kentucky will continue to lag behind the rest of the country. This may be explained by a preference for spirits and the religious sensibilities of the region. A majority of the Rocky Mountains region will see slow growth, but Colorado will continue to anchor the region in the industry, adding 100 plus craft brewing establishments. The Southwest will experience significant growth, with Texas adding over 80 establishments. Finally, New England will experience growth in the more urbanized states of New York, Pennsylvania, New Jersey, and Massachusetts, while more tourist oriented states in New England will see a minimal addition of craft brewing establishments in the upcoming years. Figure 13.16 suggests that the immediate growth in the industry will in fact gravitate towards more populous states. Also, more socially conservative areas of the country will see slower growth compared to the more socially liberal areas (Baginski and Bell 2011). Craft beer is currently growing in popularity, but will the "craft beer movement" slow down, stop or invert? When and how will markets reach their saturation points? Future studies will need to examine the micro-level economic geographies to predict future shifts of the industry at the metropolitan level.

Fig. 13.16 Planned Microbreweries and Brewpubs by State. (Source: Brewers Association)

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Too Big to Ale? Globalization and Consolidation in the Beer Industry

14

Philip H. Howard

Abstract

The global beer industry has transformed dramatically in recent decades. Two key trends include (1) consolidation resulting from mergers, acquisitions and joint ventures, and (2) the largest firms expanding into new regions. While beer was previously a very local product, these trends have combined to result in approximately half of global sales being controlled by just four firms: AB InBev, SABMiller, Heineken, and Carlsberg. Notably, these top four companies are all headquartered in Western Europe. The primary products of the largest firms are pale lagers, with ales and numerous other potential beer varieties produced only in much smaller quantities, if at all. Why are these changes occurring now? Many other industries, including soft drinks, have seen a small number of companies achieve global dominance earlier than the beer industry. Recent policy and technological changes, however, have eroded many barriers to consolidation and geographic expansion for beer firms. They have enabled the largest firms to exert more political and economic power, and to move closer to the endgame of a global monopoly. These trends are not inevitable, however, and are countered by (1) the rise of specialty brewers and their much more diverse selection of beer varieties, and (2) cultural barriers to the global branding and marketing of beer.

Introduction

Just four firms accounted for approximately half of the volume of global beer sales, and 70% of revenues, in 2012 (SABMiller 2012). This is a dramatic change from even a decade ago, when ten firms combined made up less than half of global sales (Nugent 2005). Although some of these changes are due to sales growth within firms, much of this consolidation is a result of mergers, acquisitions and joint ventures, frequently with a goal of expanding into new geographic areas.

Why are these changes occurring? Many other industries, including soft drinks, have seen a small number of companies achieve global dominance earlier than the beer industry. The motivations behind these strategies are apparent: with the primary goal of increasing profits, firms have strong incentives to expand their market share, reduce the number of competing firms, reduce input costs and exert greater leverage over prices. By acquiring or merging with other firms they increase the likelihood of achieving all of these goals.

The beer industry faced more barriers to consolidation and geographic expansion than, for example, airplane and automobile manufacturing, but these barriers are rapidly being eroded by recent economic, political and technological changes. The largest beer firms are now able to exert more power, reinforce these trends, and to move closer to the endgame of a global monopoly (although a duopoly of two firms is more likely, to maintain an appearance of competition). Such an outcome would likely increase prices for consumers, and decrease both the quality of beer and the number of choices currently available (Lynn 2012). Although there are numerous types of beer (The Great American Beer Festival, for example, has 56 categories) (Hannaford 2007), the market is increasingly dominated by pale lagers, which are indistinguishable to most people in blind taste tests (Tremblay and Tremblay 2007). In recent years the European Union has

P. H. Howard (✉)
Department of Community Sustainability, Michigan State University, Natural Resources Building, 480 Wilson RD, 48824, East Lansing, MI, USA
e-mail: howardp@msu.edu

M. Patterson, N. Hoalst-Pullen (eds.), *The Geography of Beer*, DOI 10.1007/978-94-007-7787-3_14,
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investigated leading firms for price-fixing, and the U.S. has observed price increases immediately following major acquisitions.

Beer has a number of attributes that have historically contributed to the viability of numerous small firms in the industry. It is mostly water, and therefore very heavy and expensive to store and transport. It is also a relatively simple product, with the primary ingredients, in addition to water, including malted grains, hops and yeast. This made it difficult for larger firms to gain a market advantage through innovation. Two additional barriers that had to be overcome to globalize the industry were distance and durability (Friedmann 1992). Early commercial brewers made ales and stouts that spoiled quickly, and thus were not as durable as other goods (e.g. wine, pickled vegetables, salted meat). This made it difficult to move beer long distances in time to remain fresh enough for consumption, and prevented most breweries from expanding their markets beyond limited geographic areas.

These barriers have decreased over time. In the 1800s, for example, lager yeasts, which ferment at the bottom of the brewing vessel, were recognized in Germany. This required a longer brewing time and more storage capacity (*lagern* means to store in German), but resulted in a product that took longer to spoil (Van Munching 1997). Even today ales and other non-lager beers tend to be produced by specialty brewers with much smaller market shares, or by skunkworks that are separate from the main production facilities (yet are able to take advantage of the parent firms' extensive distribution networks). Other technological innovations helped expand geographic markets for commercial beer brewers in the late 1800s and early 1900s. These included improvements in durability through the technologies of pasteurization, cheaper glass bottles, ice houses and refrigeration, as well as reducing the barrier of distance through faster forms of transportation, such as railroads and automobiles (Ascher 2012).

The World Wars and Prohibition also contributed to the declining number of, and increasing size of breweries in the U.S. and Europe. The largest breweries were able to survive Prohibition in the U.S. (1919–1933) by producing alternative products (e.g. non-alcoholic beers, soft drinks, candy, ice cream, yeast), and were better positioned when the markets reopened (Van Munching 1997). In Europe, many firms that had been damaged during the wars merged in order to scale up, obtain the necessary capital to invest in new technologies, and modernize their operations (Poelmans and Swinnen 2011). Barley shortages on both continents during the 1930s and 1940s led to use of substitutes like corn and rice. Consumers developed a taste for these lighter colored or "American" lagers, and these more industrial, standardized varieties increased their market share (Poelmans and Swinnen 2011).

After World War II governments aided the consolidation and geographic expansion of the beer industry through numerous subsidies and policy changes. These included the development of highways, which reduced transportation costs, and granting public airwaves to television companies, which in turn gave larger beer firms access to cheaper per capita advertising than smaller firms (George 2011; Tremblay and Tremblay 2005). In the United States, the enforcement of antitrust legislation enacted early in the 20th century had been weakened by the 1970s, and large mergers and acquisitions that had previously been blocked were allowed to go through. In addition, a ban on home brewing that was not repealed until 1979 helped keep new competitors out of the industry. By this time there were only 48 brewing companies remaining in the U.S. (Shin 2011).

This chapter describes the current global beer industry structure, and changes in the last few decades that have accelerated previous trends toward consolidation and geographic expansion. It then focuses on the top four firms, all headquartered in Western Europe, and the more specific means by which they achieved their current positions. The direction of these changes are not inevitable, however, and are countered by (1) the rise of specialty brewers and their much more diverse selection of beer varieties, and (2) cultural barriers to the global branding and marketing of beer.

The Global Beer Industry Structure

Figure 14.1 shows the global market share of the leading firms, with the size of the rectangles proportional to the percentage of the market controlled by each firm. These estimates are from Euromonitor International, and are more conservative than other sources that attribute as much as 55% of the market to the top four firms[1] (Schultes 2012). Multiple estimates, however, agree on the rank ordering of the top four firms, and that fact that they now control more than 40% of global sales, which is the classic definition of an oligopoly (a market dominated by a small number of sellers).

These market share figures underestimate the concentration in the industry because they do not include joint ventures or partial ownership stakes. Some examples include AB InBev's partial ownership of Grupo Modelo (at the time), SABMiller's joint venture with MolsonCoors in the U.S., SABMiller's joint venture with China Resources Enterprises (Snow Breweries) in China, and Asahi's partial ownership of Tsingtao (acquired from AB InBev). These figures also do not represent beer brewed under contract for other firms, such as SABMiller's production of nearly all of Metropoulos & Co. (Pabst) brands of beer in the U.S.

[1] Sales estimates are subject to error, because they rely on self-reporting, and firms have an incentive to inflate or deflate these figures to mislead their competitors, or to withhold them entirely.

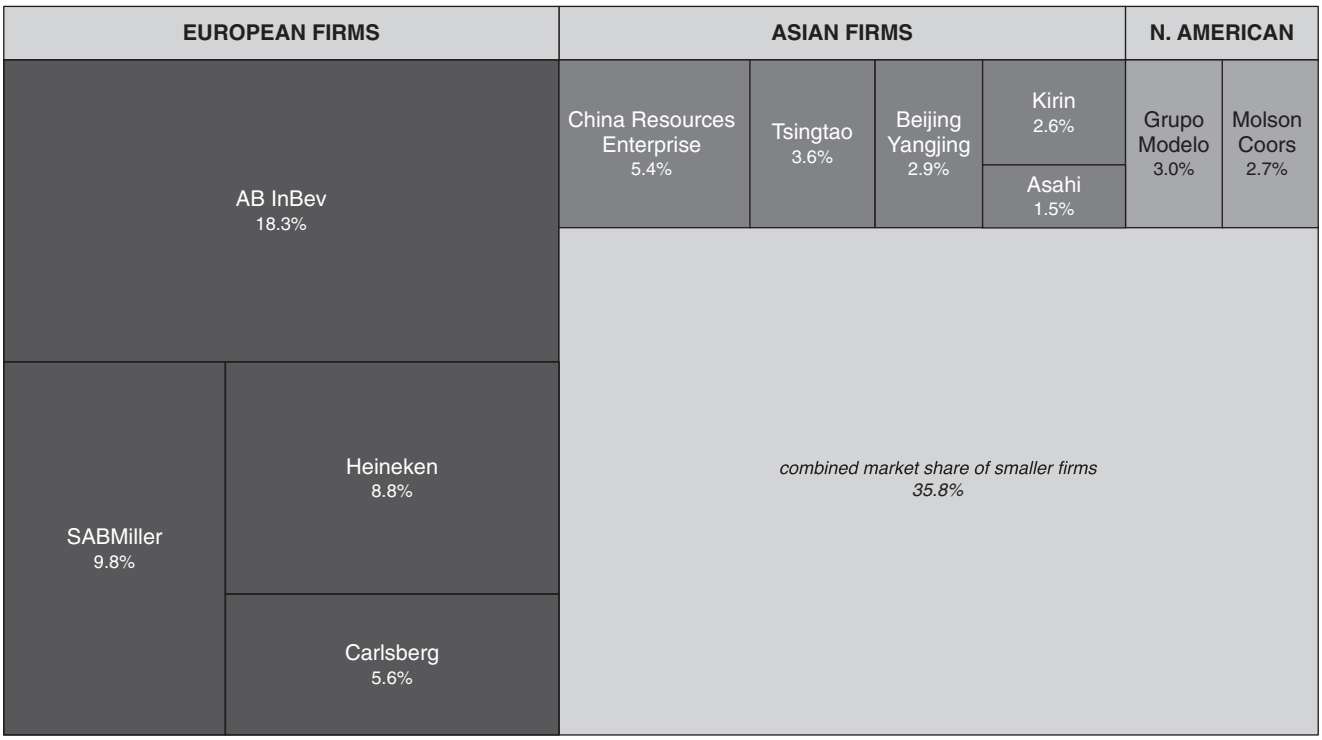

Fig. 14.1 Global market shares of leading beer firms, 2011. (Data: Euromonitor International 2012)

Economies of scale that reduce per unit costs are frequently invoked as an incentive for industry consolidation. Although these do exist, few mainstream economists recognize the role of government subsidies in artificially enhancing economies of scale (Carson 2008). The power to inflate retail prices is another incentive that deserves greater attention. In industries controlled by a small number of firms, competition may remain fierce in some areas, such as lowering input costs and spending on advertising, but they may be far more cooperative in keeping prices at profitable levels. When there are a small number of competitors, firms are able to avoid costly price wars by signaling to others their intention to raise prices, and/or following suit when other firms make such a move (Baran and Sweezy 1966). These "monopoly" prices were observed in the 1960s in industries characterized by four firms controlling more than 40 % of the U.S. market (Carson 2006). Firms may even gain unilateral power to increase prices with consolidation, if demand becomes less elastic because consumers have fewer options to switch to competing products (Slade 2011).

While the global beer market is now controlled by a small number of brewers, most national markets outside of Europe are dominated by even fewer firms. A stable duopoly is the most common pattern, but in some countries there is a near monopoly, with approximately 70 % or more of sales accruing to one firm. Examples of the latter include SABMiller in South Africa, Turkey and Colombia, as well as AB InBev in Brazil and Uruguay (Ascher 2012; Jernigan 2009).

As firms increase in size they gain more power to engage in anticompetitive practices, and in a positive feedback loop, increase the likelihood that they will become even larger. These practices may be legal or illegal, and include exerting control over suppliers, distributors, retailers and competitors. The larger the firm, the more power it has when negotiating contracts with suppliers, which is likely to result in lower input costs. In markets like the U.S., where distribution is often legally separated from brewing firms, the largest firms give distributors exclusive contracts, and use this leverage to pressure them into minimizing offerings from smaller competitors.

When dealing with retailers, size gives brewers a number of advantages. They can better afford "slotting fees" charged by many supermarkets to place products on their shelves when compared with smaller firms. Retailers also frequently turn over responsibility for planning and stocking the entire beer section to the leading firm (or their distributor). Even without direct control of the shelves, larger firms can dominate crowd out competitors by offering a huge number of slight variations on the pale lager theme, based on familiar brand names. One example is Budweiser's U.S. offerings that include Bud Light, Bud Light Ice, Bud Light Platinum, Bud Light Chelada, Bud Light Lime, Bud Light Lime Straw-ber-Rita, and many other line extensions (Hannaford 2007).

As mentioned above, a market characterized by a few large competitors can effectively use signaling to increase

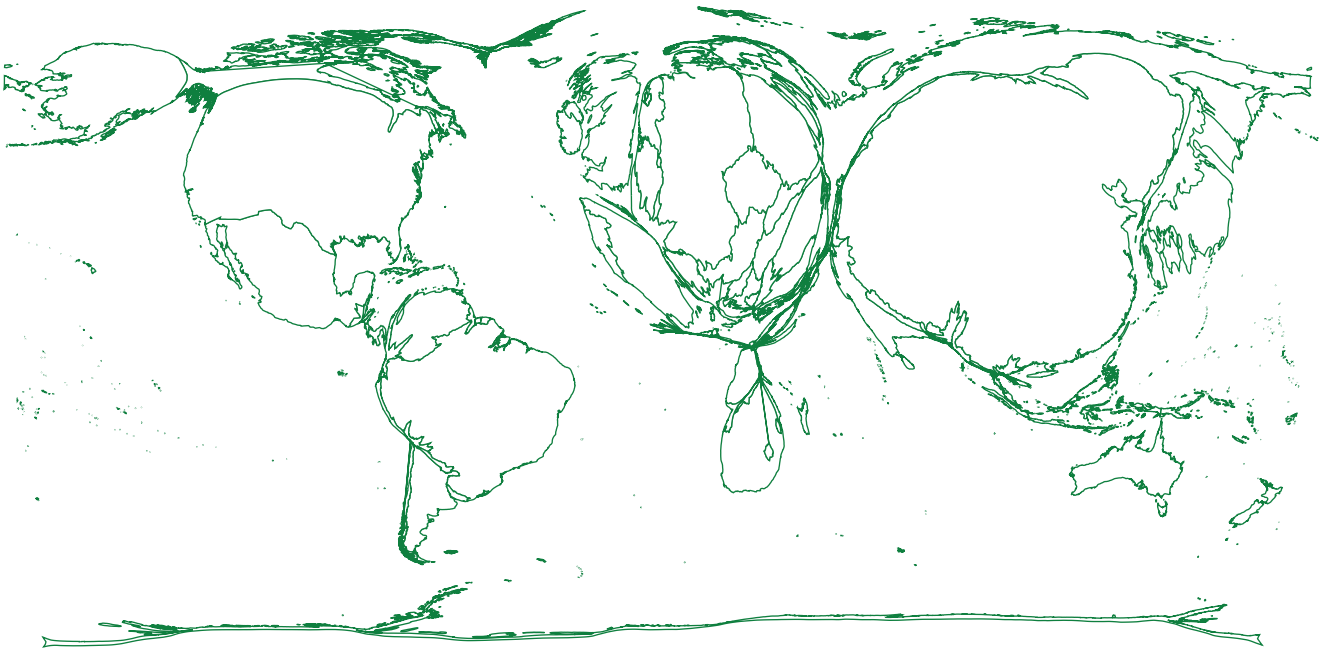

Fig. 14.2 Global beer consumption, 2010. (Data: Kirin Holdings 2011)

retail prices and profitability, but sometimes firms take a more direct route to engage in price fixing. In the late 1990s, for example, the EU investigated Heineken, Bavaria, Grolsch and InBev for holding secret meetings to divide markets and fix prices in the Netherlands. The first three firms were assessed a total of $370 million in fines in 2007, although InBev avoided penalties by providing information about the cartel (Associated Press 2007). Grolsch later won an appeal to overturn their fines by disavowing responsibility for the price-fixing actions of their Dutch subsidiary (by that time Grolsch had been acquired by SABMiller) (Bouckley 2011).

Global beer consumption is more than six times higher than wine consumption (Poelmans and Swinnen 2011), but since the 1980s a number of geographic areas, most coinciding with high incomes, have experienced flat or even declining per capita beer consumption. These are described as mature markets, and they include Western Europe, North America and Japan. In order to increase profits the largest firms are increasingly relying on expanding into new geographic areas, particularly those described as emerging markets and characterized by increasing beer sales. Some of the most important include China, India, and many countries in Latin America, Eastern Europe and Africa. Entering these markets can be much easier and cheaper via acquisitions or joint ventures with domestic firms, rather than increasing imports or constructing new brewing facilities.

Figure 14.2 is a cartogram (i.e. value-by-area map) that distorts national boundaries relative to beer consumption. It shows the importance of China's market from a global perspective. Despite lower per capita consumption of beer than Western Europe and some former colonies (e.g. the U.S. and Australia), China has a much larger population. In addition, the popularity of beer in China is increasing, and it became the world's largest beer market in 2002 or 2003 (Colen and Swinnen 2011). The country accounted for 45% of the growth in global beer sales by volume in the early 2000s (Marin Institute 2009). Currently China's market is nearly twice as large as the U.S., and totals more than one-fifth the world's sales (Ascher 2012). Africa, the Middle East and southern Asia are also expanding markets as a result of marketing non-alcoholic beers to Muslim populations (Bates 2009).

Accelerating Consolidation and Geographic Expansion

Policy and technological changes near the turn of the century have greatly accelerated processes of consolidation and globalization that were occurring in the previous 100 years. Some of the most significant involve recent trade agreements. The North American Free Trade Agreement (NAFTA) of 1994 removed tariffs on beer traded between the U.S., Canada and Mexico. This helped facilitate the merger between the Canadian firm Molson and the U.S. firm Coors to form Molson-Coors in 2005. It has also contributed to the construction of new plants, such as the Mexican firm Grupo Modelo's malting plant in Idaho in 2002, and their brewery in Piedras Negras (on the Texas border) that is expected to be the world's largest by 2016. The World Trade Organization (WTO) is facilitating increasing global dominance for the largest brewers as well. A WTO tribunal ruled against the government of India

for levying excessive tariffs on beer imports, for example, and increased market access for foreign firms. After China joined the WTO, firms from Europe, Japan and the U.S. acquired Chinese breweries or established joint ventures with them. Formerly state owned breweries in Africa and the former Soviet Union have also been privatized in recent decades, with many sold to foreign-based firms.

Just as increasing size may increase economic strength, as described above, large firms may have a greater influence on policy, which can also reinforce consolidation. For example, several leading brewers have threatened to close operations in the U.S. if proposals to raise their taxes were enacted, (Marin Institute 2009). Transnational firms have also exploited policies that allow them to have lower tax rates than smaller competitors, such as the use of tax havens (Ascher 2012). Reduced antitrust enforcement has enabled the largest firms to successfully advocate for much more rapid approvals of proposed acquisitions and mergers (Marin Institute 2009). The National Beer Wholesalers Association, for example, which is aligned with the big firms on most issues, is the currently third largest political action committee in the U.S (Ascher 2012). In addition, AB InBev and SABMiller themselves spent more than $5 million on lobbying the U.S. government in 2010 (New America Foundation 2012).

The top firms and their subsidiaries have also moved closer to global dominance through technological advantages that have reduced costs and increased the effectiveness of their marketing relative to competitors (McCafferty and Bhuyan 2012). Robotics and other automation technologies have been used to reduce labor costs, while information technologies have enabled just in time delivery and reduced storage costs. Information technologies, such as data mining have also enhanced marketing efforts. One example is the use of planograms to design and implement product placement on retail shelves with a goal of increasing sales. Planograms for the beer refrigerator case, for example, show exactly where each brand, variety and size of product is to be stocked, and can be tailored to a particular store (e.g. stocking more single beers in areas where these are purchased more frequently). The development of on-demand video has helped marketing efforts as well, as product placement in television and movies is used to subtly improve brand recognition and appeal, as well as increase beer consumption rates (Jernigan 2009).

Industry consolidation has proceeded in a geographically uneven manner, however. The case of Germany illustrates how some nations, as well as regions within nations, have been more resistant to these trends. The *Reinheitsgebot*, a law dating to 1516 that prohibited all but a few ingredients (water, barley, and hops; yeast and malted wheat were allowed later) and kept prices for imports higher than domestic beer. Although it was overturned in 1987 and imports have since increased their market share, they remain at less than 10 %, and approximately one thousand local brewers continue to cater to unique local tastes (Van Tongeren 2011). Other factors that prevented international firms from dominating the German market as easily as surrounding regions included, (1) taxes that favored smaller firms, (2) an inadequate infrastructure for television advertising until 1990, and (3) a consumer preference for glass bottles that imposed greater transportation costs on more distant breweries (Adams 2011). Even within Germany, there are more firms in the southern part of the country than in the northern region (Adams 2011). The highest concentration of breweries is found in Bavaria, where the *Reinheitsgebot* originated and beer consumption per capita leads the nation.

Western European Dominance: The Top Four Global Beer Firms

The four leading global beer firms are AB InBev, SABMiller, Heineken and Carlsberg. Figure 14.3 shows the locations of the headquarters for each firm; all are in Western Europe, and within 1000 km of each other. It is slightly misleading to characterize all of these transnational corporations as European, however. One of AB InBev's precursor firms was AmBev, itself a merger of the Brazilian firms Brahma and Antarctica in 1999. Within a few years of the firm's acquisition by Belgium's Interbrew, most of the top management positions, including CEO, were filled by Brazilians (MacIntosh 2011). Similarly, SABMiller's precursor firms included South African Breweries, and its current and incoming CEOs are both South Africans.

Figure 14.4 details some of the ownership changes made by the four largest firms from 2000 to 2012, focusing on those costing over $1 billion. The amount spent on these mergers, acquisitions and joint ventures totals nearly $150 billion, and does not include another $50 billion in transactions involving smaller firms in the industry (Ascher 2012). AB InBev's most expensive acquisition was the $52 billion purchase of Anheuser-Busch in 2008. Its recent moves include a majority stake in the Dominican Republic-based brewer CND in 2012, and 100 % equity of Mexico's Grupo Modelo in 2013. SABMiller's largest acquisition to date was purchasing the Australian firm Foster's for $10.2 billion in 2011. Heineken and Carlsberg jointly purchased the U.K. firm Scottish & Newcastle in 2008 for $15.3 billion, and divided its assets between them. Heineken has more recently acquired the Mexican firm FEMSA (2010), and increased its equity in Asia Pacific Breweries (2012). The specific strategies and geographic emphases of each of these top four firms are described further below.

Fig. 14.3 Headquarters of the world's four largest beer firms

AB InBev

Anheuser-Busch InBev, headquartered in Leuven, Belgium, is currently the dominant brewer in North America, Russia and Brazil, and has a strong position in China. Its global brands include Budweiser, Stella Artois and Beck's. InBev's acquisition of Anheuser-Busch in 2008 resulted in the name change, and shocked many U.S. beer drinkers, who did not foresee a company that controlled approximately half of the country's beer sales as vulnerable to a takeover by a foreign firm. Although the company was highly profitable, these profits were not increasing fast enough to satisfy their investors. Many analysts suggest that Anheuser-Busch's unwillingness to make acquisitions in growing markets on other continents played a key role in this outcome (MacIntosh 2011). Executives and major shareholders also had strong financial incentives for the move, with the former CEO August Busch III receiving $103 million, and the last CEO August Busch IV receiving $88.6 million for their shares (Marin Institute 2009).

InBev's dramatic acquisition of AB was aided by the availability of credit (just before an economic downturn), and little resistance from anti-trust regulators.[2] Anheuser-Busch's relatively few foreign investments included acquisitions of several Chinese firms, and approximately 50% of Grupo Modelo. In 2012 AB InBev proposed to spend $20.1 billion to fully acquire Grupo Modelo, but in early 2013 the U.S. government filed a suit to block it. The Department of Justice noted that when AB InBev raised prices, the second-ranked MillerCoors usually followed, but Grupo Modelo, in a distant third-place position did not. Regulators

[2] The firm was required to divest only Labatt USA as a condition of the sale. InBev had already acquired the larger Canadian operations of this brand.

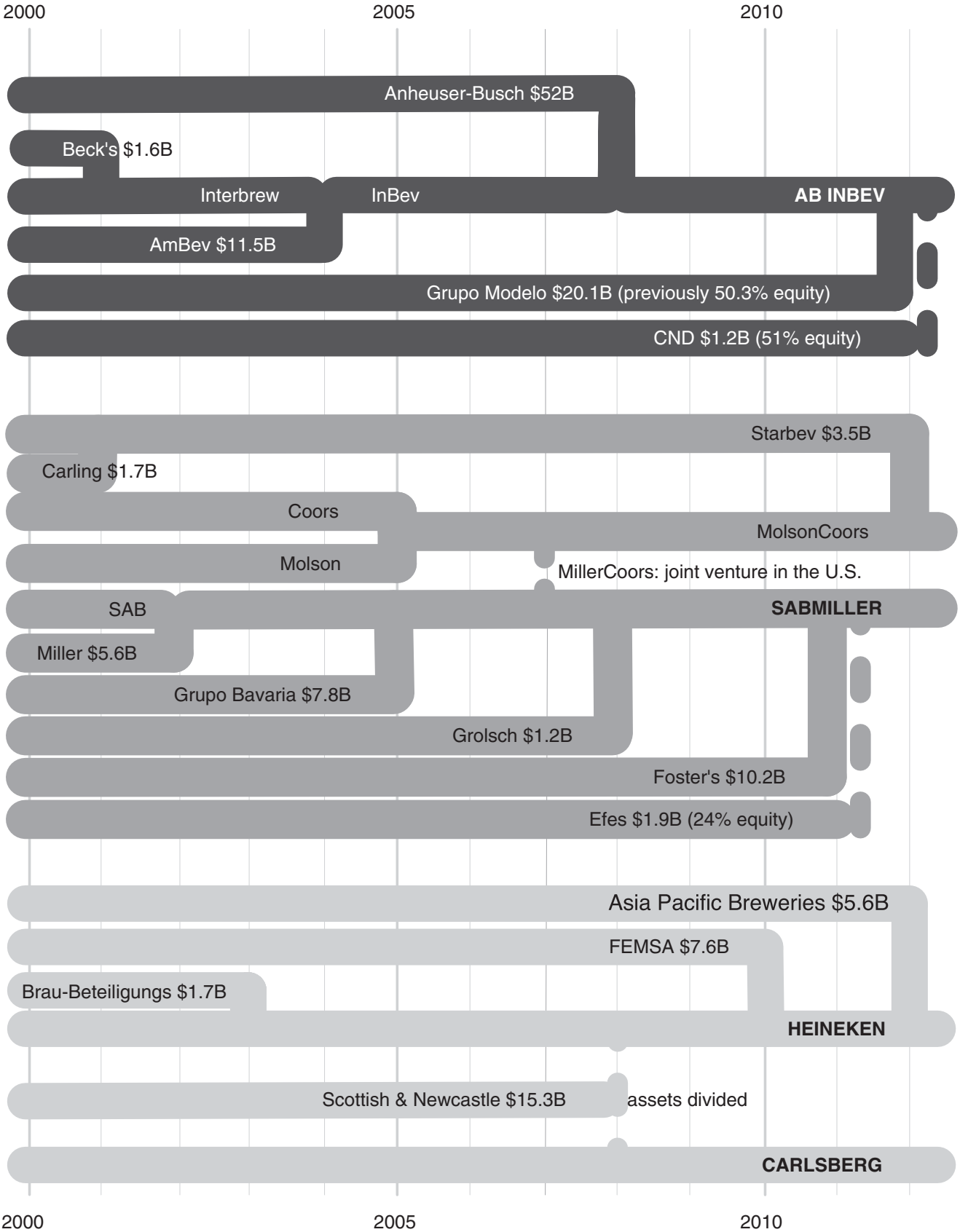

Fig. 14.4 Timeline of significant ownership changes leading to the top four global beer firms, 2000–2012

expressed concern that gaining a controlling share of the Mexican firm would lead to further price increases and less innovation (Kendall and Bauerlein 2013). By April 2013, however, an agreement was reached that allowed the acquisition to be completed. A key concession was that the Piedras Negras brewery and the rights to all of Modelo's brands in the United States would be purchased by Constellation Brands (also a dominant player in the wine and spirits industries) for approximately $4.75 billion.

InBev demonstrates how a strategy of mergers and acquisitions can consolidate an industry, but Anheuser-Busch, before its takeover, illustrates other strategies that can be used to achieve this goal. Strong U.S. antitrust enforcement in the 1950s and 60s forced AB to find alternative means to increase market share. National television advertising was one such response, and another was product proliferation (V. J. Tremblay and Tremblay 2007). Its Michelob brand currently has two-dozen different varieties, for example. Although the company once lobbied against Miller for concealing their ownership of "Plank Road Brewery," AB later imitated this strategy with faux-microbrews like Shock Top, and several organic beers that were labeled under the "Green Valley Brewing Company" label. Anheuser-Busch used other practices to hurt competitors, such as pressuring distributors to drop, or at least not promote, other firms' products (Van Munching 1997). More recently, AB was a leader in utilizing data mining to increase sales, with a system they called BudNET. The data collection involved wholesalers and retailers, and helped the firm target particular ethnic groups, and recognize shifting consumer preferences (Kelleher 2004).

When InBev took over AB they immediately increased prices on their least-expensive brands in the U.S, and CEO Carlos Brito announced an intention to raise prices even higher two years later (Frankel 2010). The firm also increased the pressure on their distributors to focus on the AB InBev portfolio, and to set prices where the firm wanted them (Heffernan 2012; New America Foundation 2012). AB InBev has been buying distributorships in U.S. states where this is allowed,[3] and is currently the largest beer distributor in the country. Firm executives have suggested changing the laws in many states that prevent them from distributing directly to powerful retailers like Walmart and Costco, in order to increase profits (Lynn 2012).

SABMiller

SABMiller, headquartered in London, is currently the dominant brewer in South Africa and parts of South America, with strong positions in China, Australia and the U.S. Its global brands include Miller Genuine Draft, Pilsner Urquell, Grolsch and Peroni Nastro Azzuro. The second-largest U.S. firm, Miller, was owned by the tobacco company Philip Morris until it was acquired by South African Breweries (SAB) in 2002, and renamed SABMiller (Philip Morris retained 25% of shares, however). In 2007 it established a joint venture with Molson-Coors in the U.S. and Puerto Rico. As mentioned previously, the combined MillerCoors also brews nearly all the beer sold by Metropoulos & Co., including Pabst and nearly two dozen other brands that have been consolidated under this firm.

Its proliferation strategies in the U.S. include marketing specialty or "craft" type brands. Leinenkugel's, for example, was acquired by Miller in 1988, but these ownership ties are not apparent to consumers. Blue Moon is another faux-microbrew, a Belgian-style wheat ale that was developed by Coors in a smaller, separate brewery. Both of these brands are now part of a craft and import division of MillerCoors called Tenth and Blake.

SABMiller was able to gain 98% of Colombia's beer market, and significant shares of the markets in other Latin American countries with its acquisition of Grupo Bavaria in 2005 (Jernigan 2009). More recently it picked up 45% of Australia's sales with the acquisition of Foster's in 2011, but this move was criticized by analysts—although profitable, beer consumption is no longer increasing in this country. That same year the firm also acquired a stake in an emerging market firm, Efes, which is based in Turkey and has strong sales in Russia and surrounding countries. SABMiller's U.S. joint venture partner, MolsonCoors, also increased its presence in Central and Eastern Europe with its acquisition of Starbev in 2012.

SABMiller has been charged with using tax havens to reduce the amounts due to governments of several nations in Africa, as well as India, although the firm denies any wrongdoing (Ascher 2012). The firm was also charged with colluding with distributors to divide market, fix prices, block rivals in South Africa in 2004. SABMiller filed its own anti-competitive claims against other firms in Mexico, charging Grupo Modelo and FEMSA with payments to retailers and restaurants in exchange for excluding other brands (Ascher 2012).

Heineken

Heineken, headquartered in Amsterdam, The Netherlands, has strong market shares in Europe and Mexico. Its global brands include Heineken and Amstel. Until recently it has engaged in many partial equity transactions, and few large acquisitions (Madsen et al. 2011). It picked up the pace in 2008 when it acquired the Newcastle brand from its portion of a Scottish & Newcastle buyout. In 2010 Heineken acquired FEMSA, which is one of two firms that now dominate Mexico's beer market, and owns brands including Tecate, Sol and Dos Equis. In 2012 it significantly increased its investment to take a controlling stake in Asia Pacific Breweries (with plans to fully acquire the firm in early 2013), and

[3] The "three-tier" system required separately owned production, distribution and retail stages for alcoholic beverages following Prohibition. Some of these regulations have been relaxed, most notably in the State of Washington in 2011.

increase its Chinese market share. Acquisitions were likely hindered due to the fact that it is a family-owned firm, and obtaining financing for the FEMSA purchase required ceding some equity (Madsen et al. 2011).

Although small in comparison to AB InBev in the U.S., the firm was also able to put pressure on suppliers to conform to parent company demands, and influence media coverage due to its high advertising expenditures (Van Munching 1997). It was fined for price fixing in France that occurred in 1996, as well as in the Netherlands case mentioned previously. Its FEMSA subsidiary includes a chain of convenience stores that refuse to carry beer from any other firms (Ascher 2012).

Carlsberg

Carlsberg, headquartered in Copenhagen, Denmark, is the most dominant firm in Eastern Europe, and has a strong position in Western Europe. Its global brands include Carlsberg and Tuborg. It is the least global of the top four firms, however, and does not have a strong focus on Africa or the Americas (Madsen et al. 2011). The company divides its markets into just three areas: Western Europe, Eastern Europe, and Asia (Carlsberg Group 2013). It now owns the brand San Miguel, as well as Baltic Beverages Holding in Russia as a result of its half of the Scottish & Newcastle buyout. The firm has also acquired breweries in Latvia, Poland and China. Until recently it was controlled by a foundation, which put it at a disadvantage for financing acquisitions (Madsen et al. 2011). Carlsberg may therefore be the most vulnerable to takeover if the industry consolidates further.

Toward a Global Duopoly?

According to some estimates, approximately three quarters of carbonated soft drink sales globally are made by just two firms, Coca-Cola and Pepsi (Pham 2012). Will the beer industry eventually follow this model of a global duopoly? Will consumers face a market characterized by fewer choices and higher prices as a result? Comparisons with other industries suggest that beer will edge closer to this model, but is unlikely to fully reach it. While barriers to consolidation discussed above are likely to continue to erode, several important barriers remain. These include cultural barriers to global brands in emerging markets, and the rising consumer interest in varieties produced by smaller specialty brewers in mature markets.

Beer consumption has a much longer history than soft drink consumption, so it is not surprising that local preferences are more difficult to change. When China opened up its beer industry to foreign investment in the mid-1990s, all of the leading firms rushed to enter this important market. Most experienced a number of setbacks though, and payoffs for a select few took much longer than expected. Common errors included underestimating consumer loyalty to local brands, and overestimating their willingness to pay higher prices. One of the firms to achieve some success, SABMiller, recognized the heterogeneity of the country, and used a geographically differentiated approach, involving joint ventures and building on local brands. The firm invested in increasing production capacity for the local brand Snowflake, in the northeastern city of Shenyang, for example, and now controls 90% of the market in this area (Heracleous 2001). These lessons have been incorporated by the remaining beer giants, who use a dual approach to market a small number of global brands, as well as a diversity of local brands tailored to specific markets.

An important counter-trend to the globalization and consolidation of beer firms has been the dramatic rise in sales of beer from specialty brewers, which offer varieties that differ substantially from industrial-style pale lagers (Tremblay and Tremblay 2011). Although these products are usually priced even higher than premium brands or imports from the largest firms, sales have been aided by narrowing price differentials. This is occurring at both ends, as the remaining big brewers enact price increases, and the most successful specialty brewers reduce costs and pass along the savings to consumers. Although new technologies are frequently barriers to entry for smaller firms due to their capital-intensive nature, this is not always the case. Packaging beer in aluminum cans has become much cheaper for smaller firms, and a number of specialty brewers are now using these and other technologies to reduce transportation costs, for example. Interestingly, U.S. specialty or craft brewers are increasing their exports to European countries such as the U.K. and Sweden, despite their relatively small size (Kelly 2013).

For consumers who seek out alternatives to the homogenous pale lagers of the beer industry giants, abundant choices will likely remain—if they are willing to a pay a price premium. As with many other highly consolidated industries, smaller firms will survive by exploiting niches that large firms are less capable of filling, and by reacting more quickly to changing consumer tastes. This includes breweries that focus on ales, porters, stouts, sour beers and other varieties that are more difficult to industrialize at the present time, and firms that stay small enough to avoid distribution bottlenecks through direct marketing (e.g. brewpubs).

Conclusion

While beer has long been exchanged across continents, in recent decades the industry has become increasingly global, as well as dominated by increasingly fewer firms. This chapter described some of the economic, political and technological changes that have reduced previous barriers to a global oligopoly. The markets of industrialized countries of Western Europe, North America and Japan remain important to the industry, but few firms remain as targets for acquisitions

in these regions. The focus has instead shifted to emerging markets in Asia, Africa, Eastern Europe and Latin America.

Among the top four firms, AB InBev and SABMiller are best positioned to benefit from further consolidation, although Heineken has also managed to make some very large acquisitions in recent years. Carlsberg has a high market share in Europe, but a similar position in the U.S. failed to keep Anheuser-Busch from being acquired by a more globally focused firm. Although the global mass market for pale lagers has consolidated, spaces have opened up for regional and national specialty brewers.

A recent U.S. lawsuit to block AB InBev's proposed acquisition of Grupo Modelo may signal a shoring up of some of the regulatory barriers to consolidation that have been eroding over the past few decades. Although the settlement kept Modelo's brands out of the hands of AB InBev in the U.S. market, this action only addresses some of the dramatic changes that have occurred during this time. A return to stronger antitrust enforcement may simply shift firms' efforts to consolidate the global beer industry in other, equally effective directions, just as they did in the U.S. in the 1950s and 1960s.

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Microbreweries, Place, and Identity in the United States

15

Steven M. Schnell and Joseph F. Reese

Abstract

Since the mid-1980s, over 2,300 microbreweries and brewpubs have sprouted and flourished in the United States. We argue that this expansion is about more than just beer. It is also about a desire on the part of many Americans to re-connect with place.. Such breweries are often proudly and self-consciously local, and often use imagery and stories associated with a particular place as a means of promoting their brews. This active, conscious creation and maintenance of attachment to place is termed neolocalism. This chapter provides an overview of the geography of microbrewing and its historical development in the United States. It then analyzes how ale names and visual marketing imagery used by microbreweries tap into this powerful concept of neolocalism, and how these images serve to create local loyalties and identities. We argue that such imagery offers a valuable window into the neolocalism movement and the process of place attachment.

Introduction

Over the past thirty years, more than 2,300 small-scale brewpubs and microbreweries[1] have opened and flourished across the United States (Brewers Association 2013a). These breweries represent a fundamental shift in the nature of brewing and beer consumption, one with distinctly geographical implications. In terms of percent of the beer market, they represent only a small fraction of the total. But what the microbrew drinkers lack in volume, they make up for with their devotion to the new, the unique, and the local.

The beers brewed by the microbrewers have more distinctive flavors than the pale lagers brewed by Budweiser, Coors, or Miller. Instead, they are a diverse array of brews that can be found nowhere else, creating a truly local experience. At

[1] For our purposes, when we speak of "microbreweries," we are including two categories of businesses, microbreweries and brewpubs. A microbrewery is generally defined within the industry as a brewery that produces up to 15,000 barrels annually, and sells no more than 25% in an onsite restaurant. A brewpub is a brewery that sells more than 25% of its beer on the premises in a restaurant setting. Further complicating matters is the rise of the term "craft brewery," defined by the Brewers Association as "small, independent, and traditional," with a production of less than six million barrels a year, and which cannot be more than 24% owned by another company that is not itself a craft brewery; this latter part of the definition is an explicit attempt to exclude the craft brew offerings of the major brewing companies (Brewers Association 2013b). Though there is a distinction between microbreweries and brewpubs, the line between the two can be quite fuzzy. Some brewpubs bottle their beer for sales elsewhere, while some microbreweries also run their own brewpubs In this chapter, we use the terms "craft brewery" and "microbrewery" alike to refer to both brewpubs and microbreweries; for our purposes, the distinctions between the types are not particularly relevant.

Significant portions of this chapter initially appeared in different form in Schnell, Steven M. and Reese, Joseph F. 2003. Microbreweries as tools of local identity. *Journal of Cultural Geography* 21(1): 45–70, and in Schnell, Steven M. 2013. Deliberate Identities: Becoming Local in a Global Age. *Journal of Cultural Geography* 30(1): 55–89. Both articles copyright © JCG Press, Oklahoma State University, reprinted by permission of Taylor and Francis Ltd., www.tandfonlnie.com, on behalf of JCG Press, Oklahoma State University.

S. M. Schnell (✉)
Department of Geography, Kutztown University, 105 Graduate Center, Kutztown, PA 19530, USA
e-mail: schnell@kutztown.edu

J. F. Reese
Geosciences Department, Edinboro University, 219 Meadville Street, Edinboro, PA, USA
e-mail: jreese@edinboro.edu

M. Patterson, N. Hoalst-Pullen (eds.), *The Geography of Beer,* DOI 10.1007/978-94-007-7787-3_15,
© Springer Science+Business Media Dordrecht 2014

the same time, they offer reprieve from the rising sea of giant national chains that have taken over retailing in every realm and crushed local businesses. Many brewpubs have also catered to our craving for uniqueness by providing one-of-a-kind social settings, commonly decorated with local historical photos, maps, and other artifacts of a place's personality.

In part, the growth of microbreweries simply reflects a change in taste. Most microbreweries put the bulk of their effort into darker ales and hoppier concoctions, more akin to many European beers, than into the pale lagers that characterize the American industry giants. We suggest, however, that the proliferation of microbreweries also derives in part from the desire of people to break away from the smothering homogeneity of popular American culture, and reestablish connections with local communities, settings, and economies. This tendency is a movement termed "neolocalism," defined as the conscious attempt of individuals and groups to establish, rebuild, and cultivate local ties, local identities, and increasingly, local economies. (Flack 1997; Schnell 2013; Schnell and Reese 2003; Shortridge 1996; Shortridge and Shortridge 1998; Zelinsky 2011).

Geographers and other observers of the American cultural scene have long bemoaned the obliteration of local character and identity in our communities (e.g., Relph 1976; Kunstler 1993). However, in myriad small ways, Americans are attempting to reclaim a sense of place and a distinctive landscape in the face of our globalizing economy. Amidst the fragmenting effects of postmodernity, David Harvey has argued, "people are increasingly reasserting personal or collective identities, identities that are often rooted strongly in place, as a conscious counter to these forces that disrupt and uproot traditional community structures" (1990, pp. 302–303).

Indeed, in recent years, parts of the general public have become disillusioned with the homogenous sea of Wal-Marts and McDonalds that have rendered one American town virtually indistinguishable from another. In response, they have actively attempted to create new senses of place, new connections with the places they live, and new locally-based economies. In the words of Marquis and Battilana, "not only has the local remained important, but in many ways, local particularities have become more visible and salient" (2009, p. 283). One category of businesses that has been an important player in this neolocal movement is the microbrewery. Microbreweries have purposefully catered to these cravings for connection through targeted marketing strategies that emphasize local identity and distinctiveness. In the process, these establishments have become important purveyors and promoters of place attachment in local communities.

Sense of place and place attachment have long been concerns in cultural geography. However, they have generally been treated as things that people simply *have*, not things that they *create* and actively maintain. This view is particularly striking when contrasted with the long-standing interest of cultural geographers in the conscious creation, manipulation, and interpretation of symbolic landscapes (e.g. Cosgrove 1998; Cosgrove and Daniels 1988; Duncan 1990; Forest and Johnson 2002; Harvey 1979; Moore and Whelan 2007; Rowntree and Conkey 1980). We feel that sense of place and place attachment must also be viewed as active, conscious processes, not as passive qualities. In our technologically connected, highly mobile, increasingly globalized country, local place attachment and identity require much more conscious effort than in the past.

Some cultural groups, of course, have long maintained connections to large-scale regions, be they ethnic homelands or nation-states (Nostrand and Estaville 2001). Our subject here, however, is identity on a much more local scale. We are interested in the ways that individual communities create and maintain identities for themselves, the ways in which they actively foster the development of a rooted sense of place. An examination of microbreweries can help us gain insight into the active ways that these sorts of attachments are being strengthened in communities throughout the country.

In 1997, geographer Wes Flack published a study that hypothesized that cravings for attachments to local places were driving the microbrewery revolution. Intrigued by Flack's hypothesis, we expanded on his work in two ways. First, we updated his research to see if the regional and social trends of microbreweries continued. In the intervening twenty years (most of Flack's data were from 1992), the industry underwent hyperactive expansion, growing six-fold by the 1990s, followed by a downturn in the late 1990s, the first in nearly a decade of expansion. Some thought that the downfall of the industry was imminent, and that microbreweries were a passing fad (Dwyer 1997; Flaherty 2000; Khermouch 2000). Today, however, microbreweries and brewpubs have entered another period of substantial growth. Their numbers are greater than ever, and as a result, are becoming increasingly mainstream. They are taken seriously as a local economic force by many politicians and local officials. They also now have a more extensive network of craft-brewing associations for support and guidance.

Second, we wanted to examine the conscious ways that microbreweries foster neolocalism. To do this, we examined images that breweries use to portray and market a sense of place. Flack (1997) describes the yearning people feel for locally brewed beer. But how does a sudsy liquid engender such strong pulls of hometown loyalty? The President of Heineken USA, Mike Foley, argued that "people are looking for something very different as part of a behavioral statement…. With a micro, they're not drinking a brand at all, but an idea" (Khermouch 1995a). The "idea" for many is connection to place. We examined this idea through the lens of the imagery that breweries are using to promote their local ties. By interpreting the images on

Fig. 15.1 Selling the local. The logo from New Glarus brewing makes the link between place, identity, and uniqueness explicit. Bethlehem Brew Works combines images of the Moravian founders of the town with an image representing the now-vanished heavy industry behemoth Bethlehem Steel. Meanwhile, Paper City Brewery hearkens back to a distant past of cobblestone streets and horsedrawn wagons, while Deschutes Brewery's Obsidian Stout logo brings together natural landscapes, distinctive geology, and outdoor recreation (the mountain bike tire around the edge of the logo). Reproduced by permission of New Glarus Brewing Co., New Glarus, WI.; Jeffrey C. Fegley, Fegley's Brew Works, Bethlehem PA; Paper City Brewery Co. Inc., Holyoke, MA; Deschutes Brewery, Inc., Bend, OR

the labels and promotional material, and by examining the beer and brewery names themselves, we investigated the nature of the places that people crave (Fig. 15.1).

The Geography of Microbrewing[2]

By the early 1990s, the rate of microbrewery growth was increasing astronomically. In 1982, there were only 82 brewing firms of *all* sizes in the entire United States. A decade later, 258 microbreweries existed (Flack 1997). By 1994, a new microbrewery was opening every three days, raising the national total of small brewers to 745; 1995 saw an additional 287 microbreweries and brewpubs (Marriott 1995; Khermouch 1996). In fact, through the early 1990s, microbrew sales were expanding 40–50 % annually, at a time when per capita alcohol consumption was actually declining (Robinson 1996; Stapinski 1997). By 1997, there were 1,273 breweries; for the first time ever, the United States had more breweries than Germany (Carroll and Swaminathan 2000). After a short period of contraction, a pattern of continued growth has prevailed, even in a climate of overall beer-consumption decline. Today, more than 2,300 establishments are brewing beer locally (Brewers Association 2013a). As Elzinga stated, "the craft brewing segment is the attention-getter in the beer industry today" (2011, p. 222).

Figure 15.2 shows the locations of microbreweries in 2012, by county, using breweries currently listed as open on RealBeer.com (Real Beer, Inc. 2012; for a version of this map in 2002, see Schnell and Reese 2003). Compared with Flack's map of 1992 data (Fig. 15.3), we can see the overwhelming growth in the microbrew market since his data were compiled. Regionally, the West Coast, the Front Range of the Rockies, the Upper Midwest (particularly Michigan and Wisconsin), remain most important. The most notable change, other than the increase in number of craft breweries, has been the rise of breweries in areas only sparsely populated by breweries in 1992: the megalopolis region of the Northeast, the Intermountain West, southern California, and the booming Sunbelt states of the Carolinas, Georgia, and Florida. Although craft breweries are on the rise in the Southeast, this region continues to lag. The Southeast currently has the fewest total craft breweries, the least craft breweries per capita, and the lowest diffusion out of metropolitan areas (Baginski and Bell 2011). Nonetheless, while the "microbrewery desert" of the Plains and South noted by Flack (1997) is still somewhat present, it is nowhere near

[2] In this section, we provide a synopsis of the geography and history of the craft beer industry, especially in the context of the neolocalism movement. Comprehensive treatments of the economics and history of the craft beer industry can be found in Warner (2010), Elzinga (2011), Tremblay and Tremblay (2011), and Acitelli (2013).

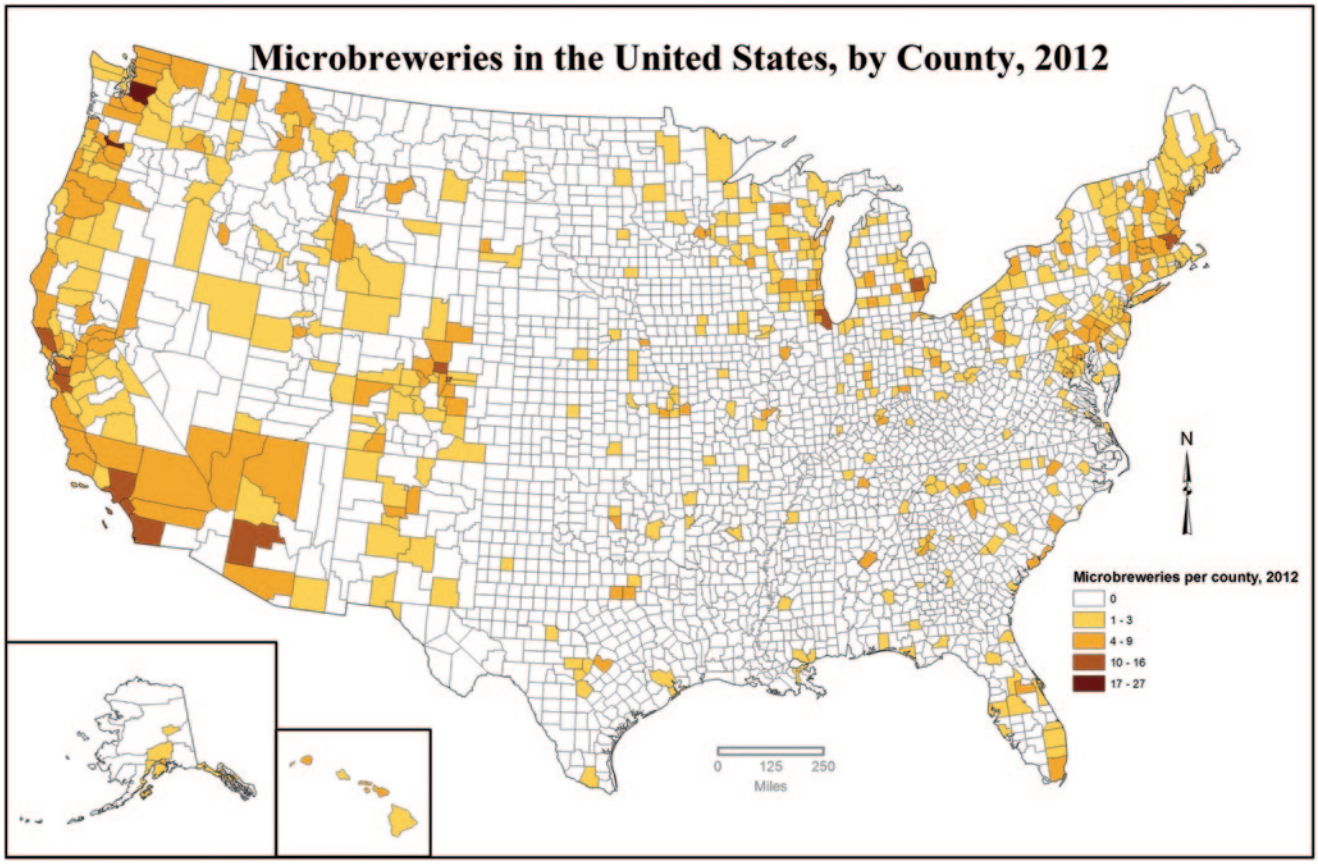

Fig. 15.2 Microbreweries by county, 2012. Cartography by authors. Data source: Real Beer, Inc. 2012

as predominant as it was then; microbreweries are increasingly being found even in those areas that are traditionally less inclined to embrace new trends. The microbrewery revolution has moved far beyond its West Coast/Colorado hearth and become a nationwide, and even international, phenomenon.[3]

The distribution of microbreweries in the U.S. shows remarkable similarities with that of another neolocal phenomenon, community supported agriculture (CSAs) (see Schnell 2013 for a more detailed discussion of the two phenomena), indicating that certain areas are clearly in the forefront as early adopters of neolocal enterprises. Both are strongest in the urban and suburban Northeast, the upper Midwest, western Oregon and Washington, and northern California, as well as along the Front Range of the Rockies, and in areas around college towns. Both have now expanded to the more resistant Plains and Southeast, but are still strongest in those initial areas.

The densest counties for microbreweries tend to be relatively wealthier, more politically progressive, whiter (and slightly more Hispanic) urban and suburban areas (Table 15.1). Counties with a microbrewery also have a smaller percentage of their population born in that county than counties without

Table 15.1 Comparisons between microbrewery and non-microbrewery counties. Figures are the mean values for the counties in each category. Gray shading indicates the larger of the two values in each comparison

	Micro.	Non-Micro.
Average HH income in $	55299	43278
% White	92.1	89.0
% Black	8.0	9.5
% Hispanic	10.3	6.8
% Native American	1.5	2.1
% Asian/Pacific	3.3	0.8
% pop. age 20–34	21.8	19.7
% pop. age 35–49	23.3	21.1
% pop. age 50–64	19.4	18.7
% pop. age 65 and up	14.1	15.7
% w/HH Income 0–20 K	21.4	28.7
% w/HH Income 20–40 K	25.8	29.3
% w/HH Income 40–60 K	20.1	19.6
% w/HH Income 60–75 K	10.5	8.6
% w/HH Income 75–100 K	10.0	6.7
% w/HH Income 100–125 K	4.8	2.6
% w/HH Income 125–150 K	2.2	1.1
% w/HH Income 150–200 K	1.9	0.8
% w/Income 200K–up	2.1	1.0
% Coll. + Grad. School Enroll.	23.6	14.6
% Born In State of Residence	59.3	71.7
% with HS Diploma	83.8	76.0
Repub. Pres. Vote 2004	51.9	62.0
Dem. Pres. Vote 2004	46.9	37.0

[3] Although microbrewing is now a national phenomenon, there is still a somewhat elitist image associated with microbrew drinkers, an image gleefully embraced by the Stone Brewing Company of San Marcos, California, with their Arrogant Bastard Ale.

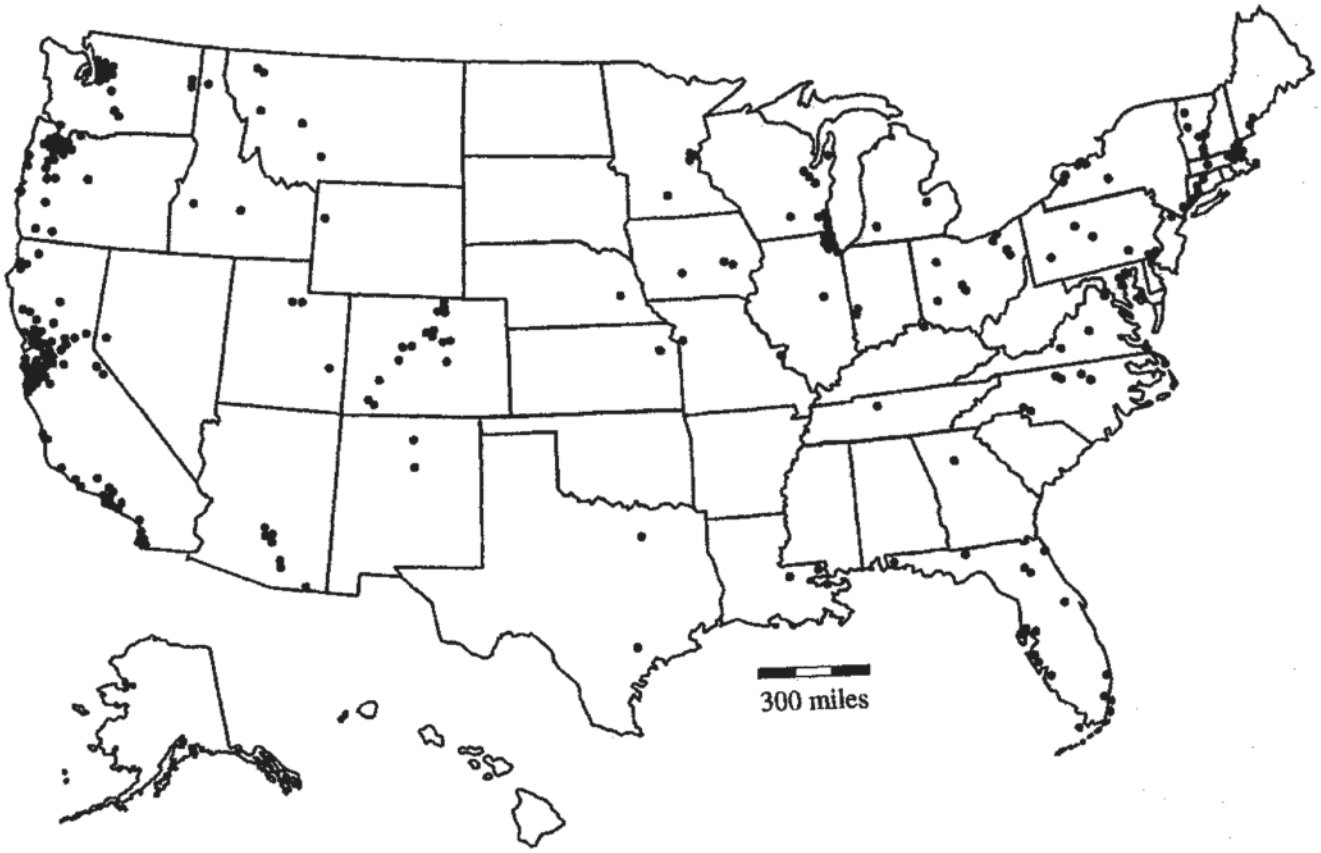

Fig. 15.3 Microbreweries in 1992. Source: Flack 1997, as reproduced in Schnell and Reese 2003

such enterprises. This trend lends support to the argument that people are driven to neolocalism in part out of a search for connection to place, a desire no doubt felt more keenly by people who have been on the move.

However, this is not the entire story, and indeed, stopping here can leave an overly stereotyped picture of neolocalism as simply the province solely of a white, privileged elite. To attempt a more detailed analysis of the type of communities more receptive to neolocal enterprises, the first author (Schnell 2013) employed the twelve county types developed by Dante Chinni and James Gimpel as part of their Patchwork Nation project (2010; see also www.patchworknation.org for fuller methodological explanations and for full-color maps detailing the distribution of these different county types). Using principal components analysis on a whole host of socio/economic/political data, they devised a classification of twelve county types (Table 15.2). Using these twelve county types, the first author compared the percentage of the country's population that lived in counties of each type, and compared it with the percentage of microbreweries found in those counties (Schnell 2013; Fig. 15.4).

The largest overrepresentation of microbreweries and CSAs can be found in Boom Towns, areas of growing diversity, and recent arrivals. Other classes where neolocalism is overrepresented are the Monied Burbs, the Industrial Metropolis, Emptying Nests, and Campus and Careers. Those

Table 15.2 Patchwork Nation community type definitions. Authored by Dante Chinni and Dr. James Gimpel, 2008. Copyright 2008-2011 The Jefferson Institute for the Study of World Politics, Licensed to Users under Creative Commons Attribution-NonCommercial-NoDerive 3.0 Unported License

Community type	Definition
Boom Towns	Fast growing communities with rapidly diversifying populations
Campus and Careers	Cities and towns with young, educated populations; more secular and Democratic than other American communities
Emptying Nests	Home to many retirees and aging baby boomer populations; less diverse than the nation at large
Evangelical Epicenters	Communities with a high proportion of evangelical Christians, found mostly in small towns and suburbs; slightly older than the U.S. average; loyal Republican voters
Immigration Nation	Communities with large Latino populations and lower-than-average incomes, typically clustered in the South and Southwest
Industrial Metropolis	Densely populated, highly diverse urban centers; incomes trend higher than the national average and voters lean Democratic
Military Bastions	Areas with high employment in the military or related to the presence of the military and large veteran populations; likely Republican voters though Democratic President Obama gained ground in 2008

Table 15.2 (continued)

Community type	Definition
Minority Central	Home to large pockets of black residents but a below average percentage of Hispanics and Asians
Monied Burbs	Wealthier, highly educated communities with a median household income of $15,000 above the national county average
Mormon Outposts	Home to a large share of members of the Church of Jesus Christ of Latter-Day Saints and slightly higher median household incomes
Service Worker Centers	Midsize and small towns with economies fueled by hotels, stores and restaurants and lower-than-average median household income by county
Tractor Country	Mostly rural and remote smaller towns with older populations and large agricultural sectors

where they are heavily under-represented include Immigration Nation, Minority Central, Tractor Country, Service Worker Centers, and Military Bastions. Mormon Outposts, meanwhile, have a distribution roughly equal with their population.

What these two analyses in tandem show is that we must be careful about overgeneralization. Though the Monied Burbs meet the generalizations we see in Table 15.1, many of the others do not—Industrial Metropolis counties, for example, are quite diverse, while Emptying Nests are considerably older on average than the nation as a whole. In addition, there is clearly a regional effect for which demographics alone, and even the broader county types, cannot account. Some parts of the country, most notably the Plains states and the Southeast, still seem to be more resistant to neolocal enterprises, even when you take into account the differing demographics, whereas the early-adopter areas are considerably more open to them. For example, Service Worker Centers nationwide are less prone to have microbreweries, yet there is a large swath of these counties in places like upstate New York that have become centers of neolocal activity. Similarly, the clustering in the upper Midwest in states like Michigan and Wisconsin cannot be simply explained with recourse to demographics or political inclinations. Careful consideration of the map turns up many more examples. This leads to the conclusion that the move to neolocalism is not readily reducible to any of these categories, although many of the socio/economic/political variables do clearly have an impact. Baginski and Bell (2011) in their detailed demographic analysis of microbreweries in the South found little correlation with most socio-demographic variables, and argued that the slower expansion of the craft beer industry stems from the more conservative religious culture of the South. However, the similar pattern found in CSA distribution (Schnell 2013) indicates that a broader cultural receptiveness (or lack thereof) to the neolocal appeal is also at work, and not merely an aversion to drink.[4]

Brew and Bust?

This flourishing of small breweries during a period when the top brewers continue to produce an overwhelming majority of beer seems paradoxical. However, the resource partitioning theory actually argues that that such increasing consolidation, in fact, creates *more* fertile ground for small specialty brewers. It also suggests that competition between the micro and macro worlds of beer would be minimal, due to differences in style and price (Carroll and Swaminathan 2000; Baginski and Bell 2011; Tremblay and Tremblay 2011).

To get into the increasingly lucrative microbrew market, many of the mega-brewers (Anheuser-Busch, Miller, and Coors) took a stealth approach in 1995 and 1996, hiding their identities in the process behind brands that project a small-brewery image. Anheuser-Busch started the faux microbrews Red Wolf and Elk Mountain (both flops). The company even tried the regional iconography and marketing that has been so successful for the micros: Pacific Ridge is only sold in certain areas on the West Coast, and Zeigenbock, whose logo includes an outline of the state of Texas and is marketed as "brewed in Texas, made only for Texans." Coors produced Blue Moon Belgian Wheat and Killian's Red[5], and Miller introduced Icehouse and Red Dog, from the fictitious "Plank Road Brewery." Plank Road was the location of Miller's first brewery, thus echoing the nostalgic evocation of old-style brewing also used in the marketing of many microbrews. Miller continued the fake-address marketing when Tenth and Blake opened in 2010 as a division of MillerCoors, focusing on specialty and import beers. Tenth and Blake is not an intersection anywhere, but a combination of the addresses of the Leinenkugel brewery in Milwaukee and the Blake Street address of the Blue Moon Brewing Company in Denver (Nason 2010). While some of these brands are still produced (and, in the case of Blue Moon, have become fairly successful), to the continued consternation of craft brewers (Tuttle 2012), they have had little impact on the growing microbrew segment.

Having largely failed with their own craft beer creations, the large brewers began to directly invest in some of the more successful and ambitious micros. One of the first to do this was Miller, who purchased Leinenkugel in 1988. In

[4] The religious culture might play a role in explaining the pattern in some areas. Evangelical Epicenter counties have a lower-than-expected incidence of microbreweries, but a higher-than-expected incidence of CSAs, the only county type where the two did not show similar trends (Schnell 2013).

[5] Killian's Red is the one exception to the mid-nineties introductions; Killian's was introduced in 1981.

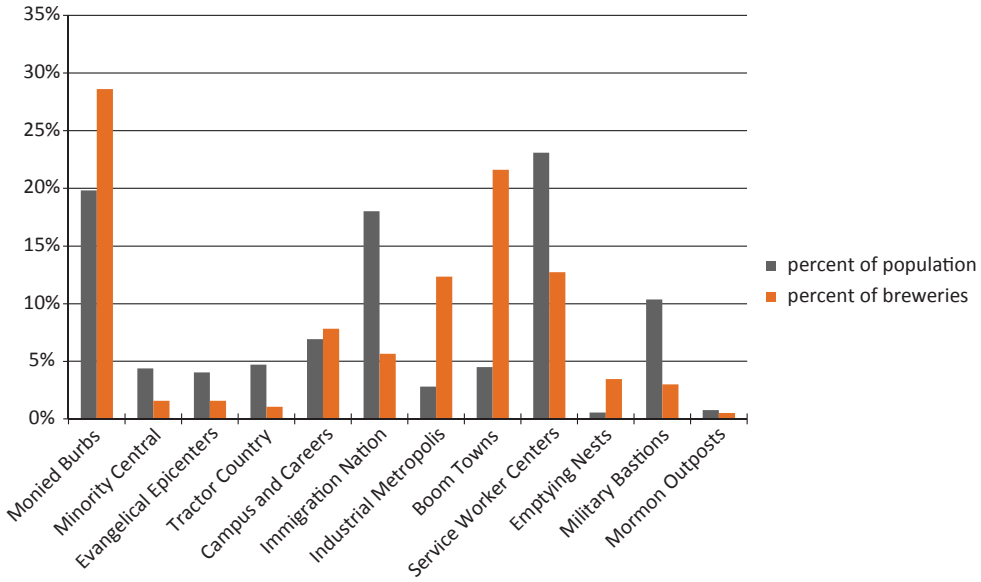

Fig. 15.4 Percentage of U.S. microbreweries found in each of the twelve Patchwork Nation county types, compared with the percent of the U.S. population residing in each county type

the mid-1990s Anheuser-Busch formed an alliance with Oregon's Widmer Brothers and Washington's Redhook Brewery (earning the latter the scornful nickname of "Bud Hook" from beer afficionados) to distribute their products (Gendron 1994; Khermouch 1995b; McManus 1995); more recently, the company has formed similar alliances with Fordham and Old Dominion. The brewer has also purchased outright Rolling Rock and Goose Island breweries, as well as a significant stake in the Craft Brewers Alliance, which was itself a merger of Widmer, Kona, and Redhook. The company shuttered Rolling Rock's long-time brewery in Latrobe, Pennsylvania, and moved production to New Jersey (Cowden 2006), thus eliminating the long-time tie to place of the Rolling Rock brand.

The resources and stealth with which the large breweries tried to capture this miniscule segment of the market (about 3% in the mid-1990s) was quite astonishing. But while the microbrew market is a small portion of the overall beer market, microbrew drinkers are willing to pay premium prices for their beers, potentially making the segment one of the most profitable in the business. Joe Martino, a senior executive of contract brewing giant G. Heileman, argued to a convention of beer distributors in the mid-1990s:

> To big brewers, the really meddlesome thing about microbrews is that they are a strong indicator of a far more encompassing national trend: the consumer's willingness to spend more—lots more—to leave their traditional brands for wholesomeness, variety and novelty. If we're going to make any headway in the microbrew segment, we need to set aside our traditional biases and take a close look at what gives this tiny market so much energy…. The microbrewers' ability to command premium prices in a declining industry is pure seduction that translates into high profit margins for brewers, wholesalers, and retailers alike…. There's no question all of us want a piece of this action. To get it, we have to change our game. The only way we can play, and win, is to start thinking small…. The microbrew segment is, by its very nature, contrary to big business in many ways… by positioning themselves as an alternative to mass production, microbrewers are able to concentrate their efforts and the bulk of their working capital on high quality and freshness…. Our biggest challenge in penetrating the microbrew segment may be big-company name recognition. How different from the 1970s and 1980s! Focus groups are telling us that the minute we attach a big name to a small label, we risk alienating a substantial number of drinkers…To succeed, large brewers need to think small—and play big. (Khermouch 1995a).[6]

The ludicrously rapid growth of the first half of the 1990s proved to be unsustainable in the second half, as the market became saturated with microbreweries and brewpubs. At the same time as the majors were honing in on the micro market, thousands of other investors and entrepreneurs jumped in. Although many of these were truly passionate about brewing, others were simply opportunists attracted to the dollar signs they saw in every glass. The result was a market saturated with beers of uneven quality. Or conversely, many enthusiastic beer-brewing whizzes struggled with the business end of their ventures (Warner 2010; Elzinga 2011). Throughout this time, the sales growth of the microbrew segment began to slow to 26% in 1996, and to 5% in 1997 (Melcher 1998). For the first time since the craft brewing movement began in the early 1980s, more breweries closed than opened in 1999 (Flaherty 2000).

During the boom, many microbrewers, heady with their success, saw vast untapped markets for their brews nationally, and many tried to expand regionally or nationally. Many such enterprises failed; the stock prices of several publically-traded microbreweries plummeted dramatically in the late

[6] One can often find frank statements such as this, made by business executives when the general public is not supposed to be looking, while reading trade and business publications of all kinds.

1990s.[7] What had seemed like an endless boom suddenly looked like a fad that had run its course, and investors bailed out. Some of the market share loss by the microbreweries in national markets was the result of hardball measures implemented by the major breweries to force distributors to stop carrying the smaller breweries (Stapinski 1997; Khermouch 1996, 1997). But more importantly, such profit-driven initiatives on the part of the microbreweries floundered because the brewers misunderstood the root of their initial success, the neolocal appeal of their product. In trying to play in the national market, they had lost touch with their local roots. As Tremblay and Tremblay observed, "The irony is that as successful micros grow, they lose their ties to local communities and can no longer be called microbreweries" (2011, p. 159).

As the market contracted, the brewers that survived tended to be those that returned to their home base. While the larger craft breweries,[8] Boston Beer (makers of Samuel Adams), Pyramid Ales, Pete's Wicked, and Redhook, lost nearly a quarter of their sales between 1996 and 1999 (Melcher 1998), many of the smaller breweries that stayed with, or returned to, local production thrived. Brooklyn Brewery, for example, ignored offers for national distribution, choosing instead to focus on its home, marketing locally and sponsoring and participating in many community events (Stapinski 1997). Boulevard Brewing Co., in Kansas City, Missouri, followed a similar strategy, growing sales without expanding distribution area (Woolverton and Purcell 2008). Many who had made forays into the national marketplace found themselves overextended and returned home as well, such as Wild Goose Brewing (Frederick, MD) and Deschutes Brewery (Bend, OR) (Khermouch 1996). According to David Edgar, president of the Institute for Brewing Studies in Colorado, "what they found was that beer drinkers in Oregon had a special affection for their Black Butte Porter, and Alabamans stuck with their Red Mountain Red Ale" (Flaherty 2000, p. C12).

In other words, the success of the microbrewery revolution had really been about more than just beer. If taste was all it was about, the faux micros would have had much more success in capturing a share of the market, since they had the distribution networks and multimillion dollar advertising budgets of the large brewers behind them. Instead, it was about supporting the local, about drinking beers produced in your own backyard, or getting a taste from somebody else's backyard, a souvenir of place (Baldacchino 2010). Woolverton and Purcell explained, "Craft brewers offer a product differentiated by both style and geographic region. Product consumption is often positioned as trying a new style in a new place, a pastime" (2008, p. 63). The "seduction" of the microbreweries described earlier by Martino could not be effectively re-created on a national scale.

It is easy to get the impression from reading the trade press of the late 1990s that the entire market for microbreweries dried up, but it is important not to overstate the magnitude of the industry downturn. While the late 1990s and early 2000s saw a contraction of numbers of breweries by about 10%, by the mid-2000s, stabilization had occurred, and the numbers of breweries resumed a slow expansion (Tremblay and Tremblay 2011). Today, there are more American breweries than any time since the 1880s. Craft brews collectively constitute about 5.7% (by volume) or 9.1% (by dollars) of beer sales today. Numbers of breweries continue to increase as well, with 250 openings in 2011, compared with only 37 closings (Brewers Association 2013a).

In fact, the shakeout of the late 1990s seems to have solidified, not weakened, the breweries' status as serious local enterprises that are passionate about producing high-quality beer. The industry has matured and now attracts mainstream as well as aficionado consumers, resulting in substantial growth (Woolverton and Purcell 2008). Many areas of the country still have a wide array of microbreweries and brewpubs. Few, in fact, mourn the loss of hundreds of brewers who hopped on the microbrew bandwagon when it seemed there was a dollar to be made. At the National Craft Brewers Conference in 2000, Gary Fish, president of the Deschutes Brewery, commented, "These events used to be full of tire kickers. There's not so many of those people here anymore" (Flaherty 2000, p. C12). Although the "tire kickers" may not be present, the conference today attracts over 4,000 participants from more than 25 countries (Craft Brewers Conference 2013).

Part of the big brewers' continuing interest in craft beers lies in their seeming resistance to recession (Tremblay and Tremblay 2011). Volume sales of craft beers rose 12% in 2010 and 13% in 2011, compared with an overall industry decline of 1.4% (Kesmodel 2009; Schultz 2011; Brewers Association 2013a). Though the pace of new openings slowed during the height of the recession, openings continually outpaced closings (Tarquinio 2009), and today, microbrew growth continues to greatly surpass that of the major brewers (Raasch 2012). Some have argued that economic recession if anything increases the loyalty to local brewers, as customers consciously purchase locally in order to keep local businesses afloat, an argument borne out by the decline in import beer consumption (but not in local craft brew consumption) during the last several years of economic travails (Tremblay and Tremblay 2011).

In the last ten years, a wave of consolidation swept through the brewing industry, making the traditional brewery giants even bigger and more global. In 2005, Molson and Coors joined forces into the MolsonCoors Brewing Company, the third largest in the US. South African Breweries (headquartered in London) purchased Miller Brewing Company from

[7] Pyramid's stock dropped from 19 to 3 dollars a share; Pete's dropped from 18 to 4 (Marcial 1998).

[8] This term is an oxymoron of sorts. While technically microbreweries, their national presence, sales volume, and their increasing lack of association with a particular locale (Red Hook expanded into New Hampshire from Washington in the mid-1990s) really qualify them as mid-tier breweries, not microbreweries. They are micro only by comparison with the three giants.

Phillip Morris in 2002, and renamed itself SABMiller. Then, in 2008, SABMiller partnered with MolsonCoors in the United States to jointly distribute their products as MillerCoors, to better compete with Anheuser-Busch. Anheuser-Busch, meanwhile, was purchased in 2008 by Belgium's InBev (which itself was a merger of Belgium's Interbrew and Brazil's AmBev a few years earlier). The combined behemoth has absorbed beer brands in 24 different countries (ABInBev 2013).

The microbrews have not been immune from consolidation either. North American Breweries was started when a private equity firm bought Genesee, Pyramid, Magic Hat, and MacTarnahan's; they were in turn recently purchased by The Florida Ice and Farm Company (FIFCO), Costa Rica's largest beverage producer, for $388 million (Reuters 2012). Some of the larger microbrewers have also renewed the push to expand nationally and internationally, whether through alliances with each other, or with one of the major breweries (such as with the Craft Brew Alliance discussed earlier, which has recently moved to export their brands to China, Denmark, Finland, the Netherlands, Hong Kong, Ireland, Japan, Norway, Sweden, Taiwan, and the U.K) (Hummel 2012). Brooklyn Brewery, meanwhile, has partnered with a Swedish brewer to build a brewery in Sweden (Brooklyn 2013). It remains to be seen whether such a move will be successful in the long run, given the past history of micros attempting to go macro. Perhaps it will find an audience abroad interested in sampling the wide variety of American craft brewing.

Nonetheless, while some microbreweries have taken this route, the overwhelming majority have continued to remain distinctly local or regional in scale. In Colorado, for example, only 22.7% of brewers ship out of state, and 10% ship internationally (Colorado Brewers Guild 2012). Sixpoint Craft Ales, in Brooklyn, does not even sell beer in bottles. Instead, they focus on selling kegs to local pubs and restaurants, and on filling 64-ounce growlers for individual customers. Said Shane Welch, owner of Sixpoint, "We are not going to pursue the traditional brewery path. It doesn't make sense to ship it halfway around the world. That is an antiquated business model" (Tarquinio 2009).

Maturation into the Cultural Mainstream

Since we published our first version of this study (Schnell and Reese 2003), microbreweries have become an integral part of a broader movement towards local food and drink and towards artisanal production. In the words of Randy Mosher,

> For more than a century, this immigrant nation tried to find ways to become one people. Finding common language in mass-market, 'modern' products was one way to do this…. They're still on the shelves, but the bright, soulless rationality of these industrial icons no longer holds so much appeal. Many of us would rather have our bread unsliced, our cheese moldy, our coffee freshly roasted, and our beer dark and maybe just a little hazy. Irrationality can be a beautiful thing. (2009, p. 142).

The microbrewing trend itself has expanded beyond beer into liquor microdistilleries, many of which are adjuncts to existing microbreweries, as well as cider production (Willey 2007; Schultz 2011; Ostendorff 2011; Reimer 2012; Steinmetz 2012). Local wineries too have expanded dramatically since the 1990s (Trubek 2008). Brewery visits have now taken their place alongside winery tours as a de rigueur part of tourist advertising for most regions of the country, and are touted as a means of experiencing the "authentic" nature of a place (Baldacchino 2010; Elzinga 2011; Murray 2012; Schnell 2011). "Ale trails," "trail-to-ale" runs, and the like increasingly are taking their place alongside more-established wine trails to draw the connoisseur to areas with a clustering of microbreweries (see, e.g., Eldridge 2009).

A small army of beer-tourism enthusiasts have contributed their literary talents by writing regional guidebooks and websites of craft breweries. These include national enteries (Crouch 2010; DeBenedetti 2011), historically significant brewing regions like Pennsylvania (Bryson 2012), craft-beer pioneer regions such as the Pacific Northwest (Morrison 2011), Colorado (Sealover 2011) and northern California (Weaver 2012) and notoriously beer friendly cities like Portland (Burningham and Thalheimer 2012) and Asheville (Glenn 2012). Also, interestingly, literature on craft beer-food pairings is becoming nearly as common as that on wine-food pairings (for example, see Oliver 2003; Calagione and Old 2009; Mosher 2009; Schultz 2012), illustrating the cultural rise of the industry. It is also clear from the authorship of the books listed above that the ranks of microbrew aficionados is no longer an (almost) exclusively male domain.

Many locations have developed active brewery cultures. San Diego, for example, is now a big brewery hub, with more than 50 in San Diego County. Visitors can obtain brewery maps, take brewery bus tours, and attend the yearly San Diego Beer Week (Dickerman 2012). In fact, across the nation, dozens of cities celebrate American Craft Beer Week in mid-May. At the regional level, at least 50 Craft Brewers Guilds currently exist across the nation (American Brewers Guild 2013). These consortia offer resources and information for brewing professionals and enthusiasts in a given region. Beyond southern California, state and local tourism agencies are routinely publishing craft brewery maps and brochures. Brew festivals abound. Tied to a different sort of mass culture, the craft beer culture has even entered into, and found firm footing in the baseball park, as well as other sports venues. Skretta reported that "the groundswell of support for (local craft beer) brands has been heard loud and clear by baseball's establishment. This is market-driven demand, not a marketing-driven demand" (2012).

Politicians, place promoters, formal brewers groups, and researchers have begun to see microbreweries as engines for job creation and economic growth (e.g., Baldacchino 2010;

Colorado Brewers Guild 2012; Dillivan 2012; Francioni 2012; Murray 2012; Tonks 2011). At the federal legislative level, in 2011, Senators John Kerry, former Democratic presidential nominee, and Mike Crapo, a conservative (non-teetotalling) Mormon Republican senator from Idaho, unsuccessfully introduced the acronym-ready Brewer's Employment and Excise Relief (BEER) Act of 2011 to reduce excise taxes on beer production; a Harvard study estimated that it could create thousands of new jobs (Simendinger 2011). Richard Neal, a Democrat from Massachusetts who sponsored the House version of the bill, said, "no matter where you visit across the country, there's a local brewery—and the jobs that go with it. These breweries do a great job of pumping life back into regions and creating tens of thousands of jobs. They also make some really good beer" (Wherum 2010; Gorski 2012).

Creating Local Loyalty

So, how do breweries create the loyalty to the local that has driven their success? Breweries and wineries construct localness in different fashion. While wineries generally ascribe their rootedness to the very soil and climate their grapes are produced in (though some import grapes from elsewhere to carry out their craft), brewers usually draw their raw ingredients from elsewhere; barley and especially hops are grown in geographically concentrated areas, and hops are said to similarly gain a large part of their character from their terroir, but most brewers are not growing their own. Beer brewers thus typically rely on different means to evoke localness: the art of brewing itself, and the narratives of place they employ in their marketing.[9]

In the course of our research, we have visited brewpubs across the United States, and noticed that, not only is the decor of the establishments filled with local color, so are the beer names themselves. These names tend to reflect the places where they are brewed, and are derived from a wide array of sources: historical figures or events, local legends, landmarks, wildlife, or even climatic events (Fig. 15.5).

The names of these microbrewery ales, we thought, would provide a valuable window through which to study regional identity. We wondered: What do people in different regions of the country perceive as particularly unique about their region? What do they take pride in? What makes where they are different from anywhere else? We initially planned to analyze names of microbrews across the country to discern regional patterns in the neolocal pride of place that has been reshaping the American landscape in the last decade. In this, we failed.

In 2002, we surveyed each of the then-currently existing 1,500 or so breweries by mail and asked them for the names of their beers, as well as information about the stories behind the names. Why were these particular images chosen? When the replies came in, we had about 400 respondents out of over 1,500 surveyed. Considering that many brewpubs without regionally distinctive names probably decided that there was no reason to answer, our response rate was quite good. During the intervening decade, we have periodically updated our research, and examined the websites of hundreds of other breweries.

In our initial compilations we attempted content analysis, and planned to map our data. We divided all the beer names with local connotations into a series of categories, and then mapped the distribution of those categories nationally. The list that we created (historical figure or event, local landmark, famous person, and so forth), soon ballooned beyond manageability. Rocks, streets, nicknames, water bodies, obscure coastal islands, wildlife, outdoor activities, rains, ghost stories, local lunatics, local visionaries (not always distinguishable), and countless other categories, all seemed like distinctive images of place. Adding to the confusion (as anyone who has ever tried content analysis can attest), the core assumption of the method—that you can divide up images or words into discrete categories—is a delusion. Take as an example Cream City Pale Ale from the Lakefront Brewery in Milwaukee (Fig. 15.6). What category, exactly, is that? The name derives from an old city nickname that referred to the color of the stone from which many of the buildings were constructed. Would that be considered local (mining) industry? Geology? Urban landmarks? City nicknames? Old brewery buildings (the picture on the label)? Or do we need yet *another* category for "brick colors"? Of course, what renders such a methodology useless is precisely what makes many names such powerful evocations of place, the rich, interconnected web of meaning that is the essence of sense of place.

The second problem inherent in our method was a conceptual one. We were able to tease out some regional patterns: coastal imagery appears on the coasts, colonial images are more likely to be found in the Northeast. But these had a very narrow range—from the trivial to the banal. We soon realized that, in our methodology, we had really lost sight of the point altogether. In our quest to map *regional* patterns, we were missing the most important aspect of the microbrewery expansion—attachment and devotion to the proudly, idiosyncratically *local*. What brewers and customers alike are after is not regional identity, but rather a sense of place unique to that location and that location alone.

As cultural geographers have shown, place attachment can be strengthened through storytelling and a heightened consciousness of local history (Tuan 1980, 1991). Such acts effectively enrich the meanings of the "invisible landscape" (Ryden 1993), as folklore, history, and local knowledge are made visible in the mind's eye. What once seemed an unexceptional backdrop to our daily lives gains multiple layers of history and meaning. This sort of place-

[9] See Maye 2012 for a discussion of this process in a U.K. context.

Fig. 15.5 Label art. Reproduced by permission of North Coast Brewing Co., Fort Bragg, CA; Midnight Sun Brewing Co., Anchorage, AK; Owners and Employees of Grand Teton Brewing Co., Victor, ID; Erie Brewing Co., Erie, PA; and Tom Young, President and Brewmaster, Great Basin Brewing Co., Sparks, NV

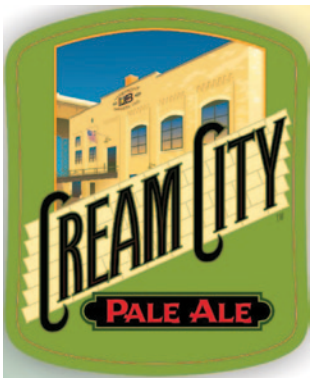

Fig. 15.6 The problem with content analysis—how to categorize this name? Reproduced by permission of Lakefront Brewery, Inc., Milwaukee, WI

creation is precisely what microbreweries are engaging in when they name their beers and decorate their establishments.

Upon reading letters we received in reply and through examining craft brewery websites, we found it remarkable how much research and effort many brewers and owners had given to the naming process, often drawing from deep-rooted affection for the places where they live. These proprietors are truly committed to being strongly rooted in a particular locale. For example, Erie Brewing Company, in Erie, PA, not only lists flavor profiles, food pairings, and awards for individual beers, but reserves considerable space for "beer stories". These stories focus on the origins of each name, wrap each name in a decidedly local context, and connect each with a sense of community spirit:

> Erie, Pennsylvania, was an important railroad hub in the mid-nineteenth century, the city being the site where three sets of track gauges met. Railbender Ale, Erie Brewing Co.'s flagship ale, named after the laborers who laid the railroad tracks is brewed with pride, strength and purity symbolic of Erie's historic railroads and railroad workers. (Erie Brewing Company 2013).

Other Erie Brewing Company beer names are also wonderfully local: Presque Isle Pilsner, Misery Bay IPA, Mad Anthony's APA, and Drake's Crude Oatmeal Stout. To really appreciate such names, you have got to know local lore, and breweries are happy to provide them, as seen in this "beer story" for Misery Bay IPA:

> The view from Oliver Perry Monument across Lake Erie's historic Misery Bay provides a constant reminder of the hardships endured during the Battle of Lake Erie (a critical naval battle in the War of 1812). Misery Bay IPA is brewed as a tribute to Misery Bay and Graveyard Pond, final resting place for many brave sailors and soldiers (who died during the winter of 1812–1813, as they constructed the U.S. naval fleet). (Erie Brewing Company 2013).

The Brewerie at Union Station, currently Erie's only brewpub, has the motto, "Revitalizing downtown Erie one pint at a time," and takes their beer name connections to an even more quirky, local level. Uncle Jack's Blonde Ale and

Fig. 15.7 T-shirt image promoting John Brown Ale (Free State Brewery, Lawrence, KS), drenched in Kansas symbolism, drawing on John Steuart Curry's famous mural, "Tragic Prelude," which adorns the Kansas statehouse in Topeka. For an image of Curry's original painting, see http://www.kshs.org/p/kansas-state-capitol-online-tour-tragic-prelude/16595 [accessed 10 June 2013]. Reproduced by permission of Free State Brewing Co., Lawrence, KS

Major McNair's Nut Brown Ale pay homage to a now-defunct Erie brewery and to Erie's first brewer, respectively. Apparition Ale recalls the story of Clara, a young girl who met an untimely end in the early 1900s in the railroad station where the brewery is now housed. Her spirit continues to haunt the premises. And, Hopness Monster IPA is a reference to the legend of a Loch Ness Monster-like creature that lurks offshore in Lake Erie (The Brewerie 2013). The strategy behind the naming of the Brewerie's beers parallels a larger trend, that of using names that are purposely obscure. In many cases, as evidenced here, such references also reveal a deep attachment to the place in which the beer was brewed.

Brewers often go to great lengths to create a distinctly local theme, and the images that adorn their beer labels often get every bit as much attention as the names themselves. For example, in this image from the Free State Brewery, in Lawrence, Kansas, we see an image promoting the brewery's John Brown Ale (Fig. 15.7). John Brown, of course, was the famous/notorious anti-slavery crusader whose violent exploits, in Kansas and elsewhere, helped to spark the Civil War. Indeed, the name of the brewery itself derives from Lawrence's status as a bastion of free-state

anti-slavery advocates in the decades prior to the Civil War. The image itself is modeled on John Steuart Curry's painting "Tragic Prelude," which adorns the Kansas statehouse in Topeka. The forceful, and slightly crazed, appearance of Brown is presided over by a looming tornado, a reference to Kansas' presence in Tornado Alley. Both images in turn take issue with the outsider's common perception of Kansas as a mild place where not much happens. The resulting image is thus a multilayered distillation of Kansas uniqueness.

Why do brewers put so much effort into their images and names? One brewer at the Belt Brewing Company in St. Joseph, Missouri, explained it this way in 2002, using as an example his own Conestoga Wheat.

> If someone comes in from the area, say from Nebraska, they are probably going to know what a Conestoga wagon is. On the other hand, if someone from Florida comes in who doesn't know what a Conestoga wagon is or what it was for, we then have the ability to share with them a little bit of our history and ideals.

Such locally rooted names produce both a sense of belonging to a unique place to the insider, and a chance to share this distinctiveness with newcomers.

This sense of belonging, of rootedness in place, is a key aspect of many of the ale names we studied. Rootedness is sometimes established by the very building the brewery is in, as with Block 15 Brewery in Corvallis, Oregon, named for the original address/block number of the brewery's building (DeBenedetti 2011). Although virtually none of the brewpubs we surveyed existed prior to the late 1980s, many are located in older, more historic buildings.[10] Indeed, it is a rare brewpub that does not include on its menu some explanation of the genealogy of the businesses that previously occupied their space, thus establishing continuity with the community. In other cases, beers are named for pre-Prohibition brews from the town, thus establishing a connection with a long-standing brewing tradition.

Tellingly, even in the most urban settings, modern city images are rarely emphasized. And modern lifestyles are almost always slighted in favor of historical or blue-collar lifeways such as blacksmiths, miners or steamboat captains. References to now-vanished heavy manufacturing history also abound. Nowhere did we find a "Stockbroker Stout" or "Systems Analyst Pilsner" or "C.P.A. I.P.A."[11] Instead, Coalminer's Stout (Blackhorse Pub and Brewery, Clarksville, TN), the Blacksmith Brewing Company (Stevensville, MT), and Lumberjack Pale Ale (Tri-City Brewing Company, Bay City, MI) are much more typical. People who work with their hands, whose very livelihood is entwined with the geography of where they live, are those used to represent the "true" place. As Rust Belt Brewing, in Youngstown, Ohio (brewer of Blast Furnace Blonde Ale and Coke Oven Stout puts it, "Our mission to become the largest Ohio-based craft brewery by exemplifying the blue collar work ethic and perseverance that built the US steel industry" (Rust Belt Brewing 2013).

Historical aspects of the region also provide a link to place. Town founders in particular are a common theme, particularly in the East and Midwest. As with the other elements studied, rarely are these names known at all outside of the immediate locality. Interestingly, the presence of Revolutionary or Civil War imagery was much smaller than we had anticipated, because if a brewery has any plans to bottle their elixir, the Bureau of Alcohol Tobacco and Firearms firmly rejects any beer names with military or weapons connotations.

In almost all cases, it is strictly local history that is honored. When the Revolutionary War is mentioned, it is with regard to specific local events, such as Stingin' Brits IPA from Rock Bottom Brewery (Charlotte, NC), commemorating the local wives who dropped hornet's nests on passing British soldiers.[12] History here is not textbook history—it is a history that requires familiarity with place.

There is also no shortage of nostalgic images of yesteryear: trains, for example, or horses and buggies or steamships (Fig. 15.8). Again, these are rarely modern in nature—there's no Amtrak Ale, or I-35 Dopplebock, but rather steam trains, tallships, the Old Post Road, and the Pony Express. Plenty of label images of old-time beer production or consumption exist, and a number of beers were even named after old historic breweries in the region; such images are clearly meant to contrast with the mass production of the megabrewers like Anheuser-Busch. As the owner of Stone Brewing Company in San Marcos, California put it, "Our company logo and protector, the Stone Gargoyle, prevents modern day evils (chemical preservatives, additives and adjuncts) from tainting our beer" (personal communication 2002). All of these nostalgic images serve as windows on the type of community and the type of society that is widely perceived to have vanished in our modern, harried existence.

Another source of rootedness is found in the seasons and in the harvest cycle. Much as farmers' markets and community supported agriculture have brought the idea of seasonal produce consumption back to public attention, so too have microbreweries returned to brewing particular beers only when the season is right; most brewers have a list of seasonal beers alongside their year-round offerings. Again, regardless of the brewery's setting, rural and agricultural imagery abounds, both in the names and the labels (Fig. 15.9), as with Heifer Weizen from the Cortland Beer company in

[10] This includes perhaps the world's most exclusive microbrew, White House Honey Ale, brewed at the request of President Barack Obama in 2011.

[11] A common abbreviation for India Pale Ale, a beer style.

[12] Rock Bottom is, unlike the other breweries mentioned here, a national chain, but they regularly give their beers local names to try and mimic the local feel of other breweries.

Fig. 15.8 Nostalgic images of yesteryear. Reproduced by permission of North Coast Brewing Company, Fort Bragg, CA; Shipyard Brewing Co., Portland, ME; Berkshire Brewing Company, Inc., South Deerfield, MA

Cortland, New York.[13] Some advertise direct connections of the brewery to local farmers, as with Pig's Ass Porter, at Harvest Moon Brewing Company in Belt, Montana, named after a local pig farmer came by the brewery one day to pick up spent grains for feeding to his pigs. Other, more eclectic rural references also abound, as with Wynkoop Brewing Company (Denver, CO) and their Rocky Mountain Oyster Stout, brewed with actual bull testicles.

Breweries have increasingly begun to tout their use of locally sourced ingredients—fruits, herbs, honey, even vegetables—and old local brewing traditions to give a literal taste of place to the beer drinker. Says Kim Kowalski, brewer at the Mount Pleasant Brewing Company (Mount

[13] A play on words with hefeweizen, a common style of beer brewed with wheat.

Fig. 15.9 Rural imagery. Reproduced by permission of Lakefront Brewery, Inc., Milwaukee, WI; Brian and Minnie, of Sprague Farm and Beer Works, Venango, PA

Pleasant, MI), "anything we can harvest locally is what I like to use. Local honey, local vegetables or fruits or herbs is really fun because it says who we are. In Alaska, they can do different things than we can do. Speaks for the area it comes from" (Mahaffey 2012; see also Carmichael 2008). Antebellum Ale from the Craggie Brewing Company (Asheville, NC) is derived from a traditional North Carolina recipe of just molasses, spruce, ginger, water, and yeast (Myers 2012). And, some brewers, such as Sprague Farm and Brew Works (Venango, PA) are now even growing their own hops. Tundra Brewery (Stamford, NY) grows their own hops and barley as well, and sells the resulting brew at the Greenmarket in Union Square in New York City alongside other local farmers (Sen 2011). Stone Brewery (Escondido, CA) has a 19-acre farm that produces not only hops, but also organic produce for their brewpub's restaurant.

Although images of nature are found on beer labels throughout the country, they dominate the imagery from the Rocky Mountains to the west coast, making up some 70% of locally-based brew names in our earlier data from the region (Fig. 15.10). Historical images become less important. Instead, rootedness stems from nature, from the "unspoiled" landscape first encountered by Native Americans and then Euro-American pioneers. While eastern outdoor images on labels often had human structures (farmhouses, covered bridges, wagons), human artifacts are notably less prevalent on western nature-based labels. Typically, when people do appear, it is in the guise of activities that put people in touch with the outdoors such as mountain biking, hiking, or surfing: Pipeline Porter in Hawaii (Kona Brewing Co.), Ice Axe India Pale Ale in Oregon (Ice Axe Grill), or Derailleur Ale in Utah (Moab Brewery) (Fig. 15.11). One name (Detonator Doppelbock, of Fish Tale Ales in Olympia, Washington) was even named, "to encourage the removal of unnecessary dams," in the words of the respondent to our survey. Most outdoor names or images, of animals, plants, landforms, mountains, valleys, or rivers, are clearly meant to be icons of unspoiled wilderness splendor, as with Sockeye Red IPA and Kodiak Brown at the Midnight Sun Brewing Company (Anchorage, AK). Eddyline Restaurant and Brewery (Buena Vista, CO) gets its name from the area of a river between two currents. Other evocative landscape names include Tamalpais Tripel (Ross Valley Brewing, Fairfax, CA), Hanging Lake Honey Ale (Glenwood Canyon Brewing, Glenwood Springs, CO), Pahoehoe Porter (Kona Brewing Co., Kona, HI). For many western breweries (as well as some in the East), it is possible to get a good sense of the appearance of the local natural environment and landscape by simply reading the names and examining the artwork on the labels. Some even require a more detailed explanation of physical geography, such as Frog Level Brewing Company in

BRISTLECONE
BROWN ALE
= 12 FL.OZ =
UINTA BREWING
NURTURED
BY
UINTA BREWING CO.
Salt Lake City
UTAH
U.S.A
BEST BEFORE
UINTABREWING.COM
KEEP COLD
EARTH, WIND AND BEER
BREWED WITH RENEWABLE POWER WIND & SOLAR
GOVERNMENT WARNING: (1) ACCORDING TO THE SURGEON GENERAL, WOMEN SHOULD NOT DRINK ALCOHOLIC BEVERAGES DURING PREGNANCY BECAUSE OF THE RISK OF BIRTH DEFECTS. (2) CONSUMPTION OF ALCOHOLIC BEVERAGES IMPAIRS YOUR ABILITY TO DRIVE A CAR OR OPERATE MACHINERY, AND MAY CAUSE HEALTH PROBLEMS.
FOR BEST FLAVOR
ENJOY IN A GLASS
CA REDEMPTION VALUE
7 09326 01303 8

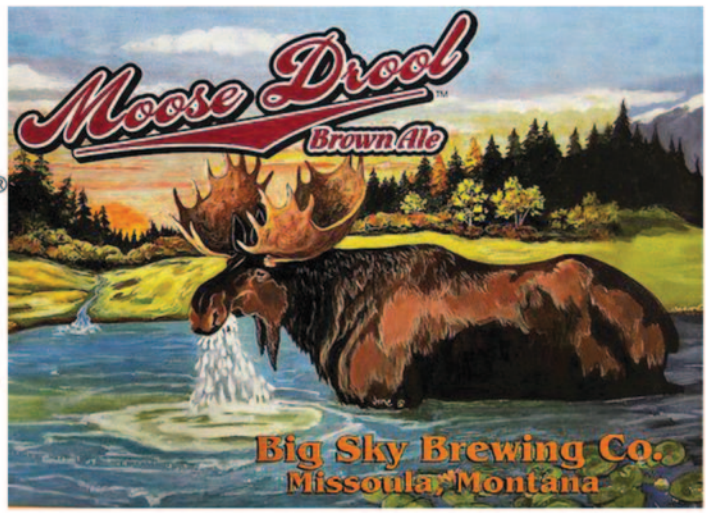

Fig. 15.10 Wildlife and the natural world. Reproduced by permission of Uinta Brewing Co., Salt Lake City, UT; Four Peaks Brewing Company, Inc., Tempe, AZ; Big Sky Brewing Company, Missoula, MT; Employees and Owners of Grand Teton Brewing Co., Victor, ID

Fig. 15.11 People in nature, a staple of brewery imagery, particularly in the American West. Reproduced by permission of Kona Brewing Co., Kona HI; Moab Brewery, Moab, UT

Waynesville, North Carolina, "a reference to the frost line on the mountains that rise around Wayneseville. Above the frost line, frogs can't live, but below the line, they thrive. Another story says that the Frog Level section of Waynesville is so nicknamed because of the historical flooding" (Myers 2012, p. 47).

In some cases, the brewer's devotion to the local goes beyond the brewpub. Many of the most successful microbreweries are indeed entrenched in their communities, and have become avid supporters of local businesses, causes, and initiatives (Tremblay and Tremblay 2011; Colorado Brewers Guild 2012; Dillivan 2012). Wynkoop Brewing, the first craft brewery in Denver, and one of the oldest in Colorado, brews special beers to raise money for local institutions like the Denver Zoo and the Denver Museum of Natural History, and makes a point of using as many Colorado-produced products on their brewpub menu as possible.[14] Left Hand Brewing Company in Longmont, Colorado, has a full-time employee devoted to non-profit donations (Sealover 2011). A number of breweries have engaged in campaigns to save and protect local wild areas. For example, Berkshire Brewing Company (South Deerfield, MA) periodically brews the Franklin Land Trust Preservation Ale, to benefit the eponymous organization. Oakshire Brewing Company (Eugene, OR) recently brewed Skookumchuck Wild Ale (Skookumchuck is a Chinook word for "powerful water"), a limited-edition beer to benefit the Berggren Watershed Conservation Area:

> The [92 acre] property is the site of a developing Demonstration Farm which will showcase sustainable techniques for farming in an active floodplain, while integrating educational opportunities and native habitat restoration. The links between local foods and watershed protection on this property motivated Oakshire to invest proceeds from the sales. (McKenzie River Trust 2011).

Local sporting teams are sometimes a focus, but significantly, these are almost never major league sports. A rare exception is Cleveland Brown Ale (our guess is that the pun was just too good to pass up). Renegade Red in Poughkeepsie, New York commemorates minor league baseballers, as did Crawdad Red Ale in Hickory, North Carolina (Olde Hickory Brewery). Rough Riders Amber Wheat, meanwhile, was

[14] Wynkoop is the brewery co-founded by John Hickenlooper, who went on to become mayor of Denver, and in 2011, governor of the state of Colorado.

Fig. 15.12 Imagery need not be a point of pride, just distinctiveness. Reproduced by permission of Great Lakes Brewing Co., Cleveland, OH; Utah Brewers Cooperative, Salt Lake City, UT

named after Cedar Rapids' minor league hockey franchise. So too was Ice Bat beer in Austin, Texas. Such teams have limited, if any, following outside of the local area, and that is precisely the point (as is the likely exorbitant fee required to use major-league imagery). Holding with the themes of history and tradition that permeate ale names, such names are sometimes looking backwards, as with Salt City Slugger Golden Ale (Lighthouse Brewing Company, Manistee, Michigan, now defunct), named after a long-vanished 1890s-era baseball team.

Other insiders-only names refer to local characters, or legends, or ghost stories. Trap Rock Brewery of Berkeley Heights, New Jersey, once offered Six Witches Stout, named after six witches whose graves are rumored to have been paved over by a local road. The legend tells of how the witches exacted their revenge by causing six bumps to form in the road after it was completed. Brinkley's Maibock at Free State Brewery in Lawrence, Kansas, meanwhile, plays on the traditional association of goats with the bock style of beer. Dr. John Brinkley was known in 1920s Kansas as the "goat gland doctor," who tried to cure fertility by surgically implanting goat glands in the affected individuals. Brinkley was also a radio pioneer, hawking all manner of mail-order medicines over his high-powered broadcast station that could be heard for a thousand miles. When the FCC shut him down, he moved across the border into Mexico and continued on apace.

Interestingly, pride is not even a necessary component, only uniqueness. In Cleveland, Ohio, for example, the Great Lakes Brewing Company offers Burning River Pale Ale, an insider's joke on one of the city's more appalling episodes, when the Cuyahoga River caught fire. Wasatch Brewery (Ogden, Utah), meanwhile, offers Polygamy Porter, a name that has raised eyebrows and earned the brewery some national press when first introduced (Fig. 15.12).

Conclusions

Upon examination both of recent trends in the microbrewery business, and of the imagery used in successfully marketing microbrews, we have determined that the neolocalism noticed by Flack twenty years ago, and confirmed by us a decade ago, is still very much alive, and is indeed stronger than ever. The very nature of the microbrewery "bust" of the mid-1990s, rather than signaling the end of a short-term pop culture hiccup, reveals the staying power, and the true place-

bound nature, of these businesses that are now entrenched in modern culture.

Many, if not most, of the images used to market these microbrewery beers are obscure to anybody but the initiated insider, and this sense of community that comes from having such knowledge is a widespread part of the appeal. Keep in mind, such local breweries are not attempting to sway a national audience, and in many ways, the more obscure the reference, the better. Big Sky Brewing in Missoula, for example, offers Slow Elk Oatmeal Stout, so named because "in Montana, cows are often referred to as 'Slow Elk,' both because they often share the same pastures and because every year some myopic hunter shoots a cow during elk season." (owner's letter to authors, 2000). Whether it is Yokayo Gold in Ukiah, California (Yokayo was the original Pomo Indian name for the Ukiah Valley), or Oosik Stout in Skagway, Alaska (Oosik is an Inuit word for walrus penis bone), the focus of brewpub ale names is overwhelmingly on local landmarks, local history—in short, on local knowledge. These are insiders' clubs, places intended to be unlike any other. In many instances, upon reading a list of ale names from an establishment, only one possible location can be ascribed.

This is marketing, not for the masses, but for the select few. It also is an overt statement of pride in the distinctiveness of place, an expression of neolocalism. Interestingly, this highly local emphasis revives, in its own small way, the oral (or at least, menu-printed) tradition of storytelling that is a key component in creating local place identities (Tuan 1991). To be initiated, we have to learn the local lore and engage with the stories that give shape to a local sense of place.

By examining microbrewery imagery, we can gain greater insight into the process of neolocalism. At a time when the cultural and commercial landscape is becoming increasingly homogenized by national and multinational corporations, many people are actively proclaiming the difference and distinctiveness of their locales. Microbreweries are one of the tools they employ to build and renew their sense of loyalty to local places. One of the key conclusions we drew from our study is the importance of conscious creation of place attachments to the neolocal movement, the willful cultivation of a sense of rootedness and a sense of place. While beer names at first seem to be trivial marketing ploys, they are in fact indicators of a much deeper trend in American culture. In a highly mobile society such as ours, community and sense of place require commitment and effort. Microbreweries are evidence that growing numbers of Americans feel a lack of local connections, and will embrace enterprises that promise them reconnection with the economy, history, environment, and culture of their home.

When one of the authors visited the Magic Hat Brewery in South Burlington, Vermont in 2003, visitors were treated to a slide show detailing the death and rebirth of small breweries over the last century. Towards the end of the presentation, the brewers made the neolocal philosophy of the microbrewery movement explicit:

> The rebirth of craft-brewed beer is about nothing less than Americans insisting on unique full-flavored high quality foods once more. We've gained a new appreciation for local products made by real people in real places. We've suddenly remembered that these things are an important part of our lives and our communities, and that much of what they give us can't be measured in pints or pounds.

In other words, the explosive growth of microbreweries indicates a desire on the part of an increasing number of Americans, brewers and consumers alike, to reconnect with the cities or the towns in which they live, to resurrect a feeling of community tied to a specific landscape. Indeed, one study carried out since we did our initial version of this chapter found connection with the community to be the single most important factor influencing loyal microbrew consumers (Murray 2012). This, in essence, creates a new narrative of place adopted by neolocals, one not driven by impersonal market forces but rather by individual and community empowerment. Microbreweries have been one notable area where resistance to corporatization and homogenization has succeeded beyond anybody's expectations. But microbreweries are not merely negative reactions against something. Microbreweries have become part of a broader political, social, and economic undertaking, one in which local knowledge, local business, local economy, and local connections are all consciously cultivated, and one in which place connections and identities are nurtured. In the process, microbreweries also help to create living narratives of place, distinctiveness, and belonging.

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Neolocalism and the Branding and Marketing of Place by Canadian Microbreweries

16

Derrek Eberts

Abstract

From modest beginnings, when every brewery was locally oriented and small in scale, Canada's brewing industry went through a prolonged period of consolidation through the mid-twentieth century. During this time, the larger, national brewing companies expanded through merger and acquisition, and increasingly standardized the products offered in markets across the country. More recently, a microbrewing renaissance emerged in the mid-1980s, which saw dramatic growth of new, small scale, craft brewers oriented principally to local markets again. The new microbreweries often invoke geography and place in their branding and marketing strategies, to emphasize their connection to their locations. This strategy is known as 'neolocalism', and it is evident that microbreweries are much more likely to use this strategy than the national brewing companies. This chapter documents some of the ways in which Canadian microbreweries use neolocalism to connect to place, and through an analysis of brewery and beer brand names, demonstrates the difference in tendency of microbreweries versus national brewing companies to do so. In addition, the response of the national brewing companies to the new competition from microbreweries reveals a new approach to merger and acquisition—one which embraces neolocalism and place-connection.

Introduction

[Microbreweries hark] back to a time when brewing companies were local businesses producing beer for local people. (Beaumont 1995, p. 6)

In 1982, Canada's first contemporary microbrewery[1] opened, reversing a trend of consolidation through merger and acquisitions that had marked the previous half century of the brewing industry in this country. As in the US, the period from about 1930 to 1980 saw a nearly continual reduction in the number of brewing companies, as the larger ones expanded by taking over local companies across the country. From

[1] A brief comment on terminology: the terms microbrewery and craft brewery will be used frequently in this paper. In Canada, there is no nationally established definition of either term. While the definition of 'microbrewery' varies by province, the key feature is scale; as the name implies, microbreweries brew on a small scale. A threshold annual production of 60,000 hL is often used as the common defining capacity in Canada. The term 'craft brewery' is even less well established. It is not based on size alone, though craft breweries are indeed normally small in scale, or at least the beer is produced in small batches. Rather, the term craft brewery is generally used also to refer to the character of the beer and the method of production. Perhaps the term is best summarize by the author widely credited with having coined it: craft beer refers to beer produced by "a small brewery using traditional methods and ingredients to produce a handcrafted, uncompromised beer that is marketed locally" (Cottone 1986, p. 9). Operationally, this definition is difficult to apply, but without much controversy, it is accepted that the largest, national brewers in Canada are not craft breweries, while the small, local ones are. We might also add that, in general, craft breweries are independent businesses while the larger, national ones are now actually subsidiaries of global beverage corporations. As such, the author hopes the reader will accept this informal method of describing and differentiating breweries for the purposes of this paper.

D. Eberts (✉)
Department of Geography, Brandon University, 18th Street, Brandon, MB R7A 6A9, Canada
e-mail: ebertsd@bradonu.ca

M. Patterson, N. Hoalst-Pullen (eds.), *The Geography of Beer,* DOI 10.1007/978-94-007-7787-3_16,
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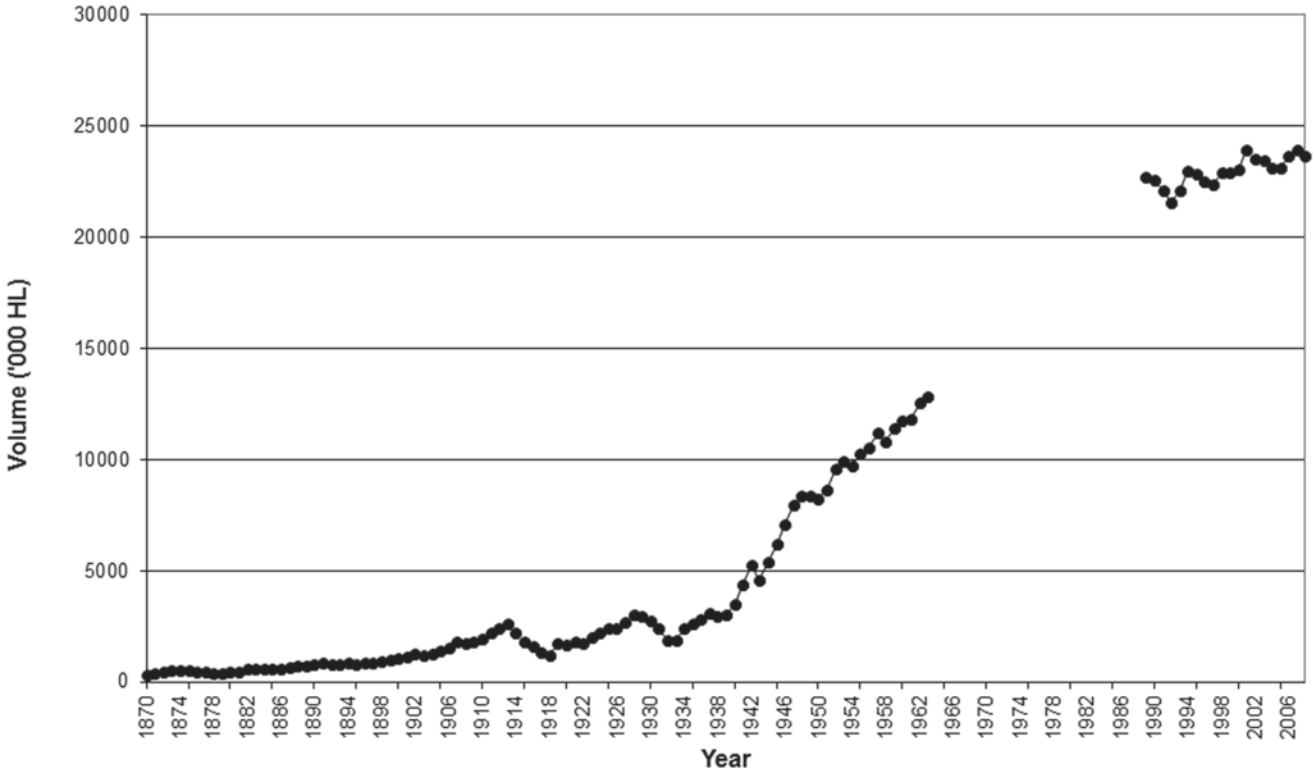

Fig. 16.1 Beer Production in Canada, 1970–2006. (Sources: Brewers Association of Canada 1965, 1999, 2003, 2007, 2009. Data unavailable from 1964 to 1988)

a previous peak of about 180 independent brewing companies in the 1860s, Canada's brewing industry had reduced to fewer than 40 by the beginning of the 1980s, and of these, three were national operations—Molson, Labatt, and Carling O'Keefe—with numerous brewing facilities across the country. But the revival of craft beer has been marked by a rapid expansion in the number of breweries operating in Canada, and these new breweries are opening in wildly diverse geographic markets, east to west, urban to rural. By 2009, Canada counted nearly 210 brewing operations. Most are small scale, serving (at least initially) geographically small markets. Beer has become 'local' again.

While the primary impact of this change for the consumer has been a massive expansion in choice and a considerable improvement in the quality of beers available, the focus of this chapter is on the ways in which small breweries have embraced their local identities in part by incorporating these into their branding and marketing strategies. The term 'neolocalism' refers to this celebration of place (Flack 1997). Specifically, I argue here that in addition to brewing beers marked by distinctive flavours and styles, microbreweries deliberately use strategies of neolocalism in the branding and marketing of both the companies and their products, as a means of differentiating themselves from the national and international brewing companies. As a result, microbreweries have become "tools of local identity" (Schnell and Reese 2003), helping to reconnect people with the places in which they live.

The Decline and Rebirth of Microbrewing in Canada

While all of Canada's breweries started as single plants operating in local markets, the industry went through a period of substantial consolidation through the middle of the twentieth century. Even as the output of Canada's brewing industry rose steadily (with minor exceptions during WWI, the Great Depression, and WWII), the number of breweries followed a rather dramatic downward trajectory (see Figs. 16.1 and 16.2). This is largely a consequence of the pattern of mergers and acquisitions which marked the business of brewing through this period. For instance, following the shakeout due to Prohibition in the early 1920s, by 1945 there were only 61 breweries, owned by 30 companies, still operating in Canada. By the mid-1960s, this had reduced to about 10 companies operating 52 breweries, with the 'Big Three' (Labatt, Molson, and Carling O'Keefe) having emerged as dominant national brewers. Consolidation continued, and when Molson bought Carling O'Keefe in 1989, the national market was dominated by only two big companies. Both of these were eventually bought by or merged with foreign brewing

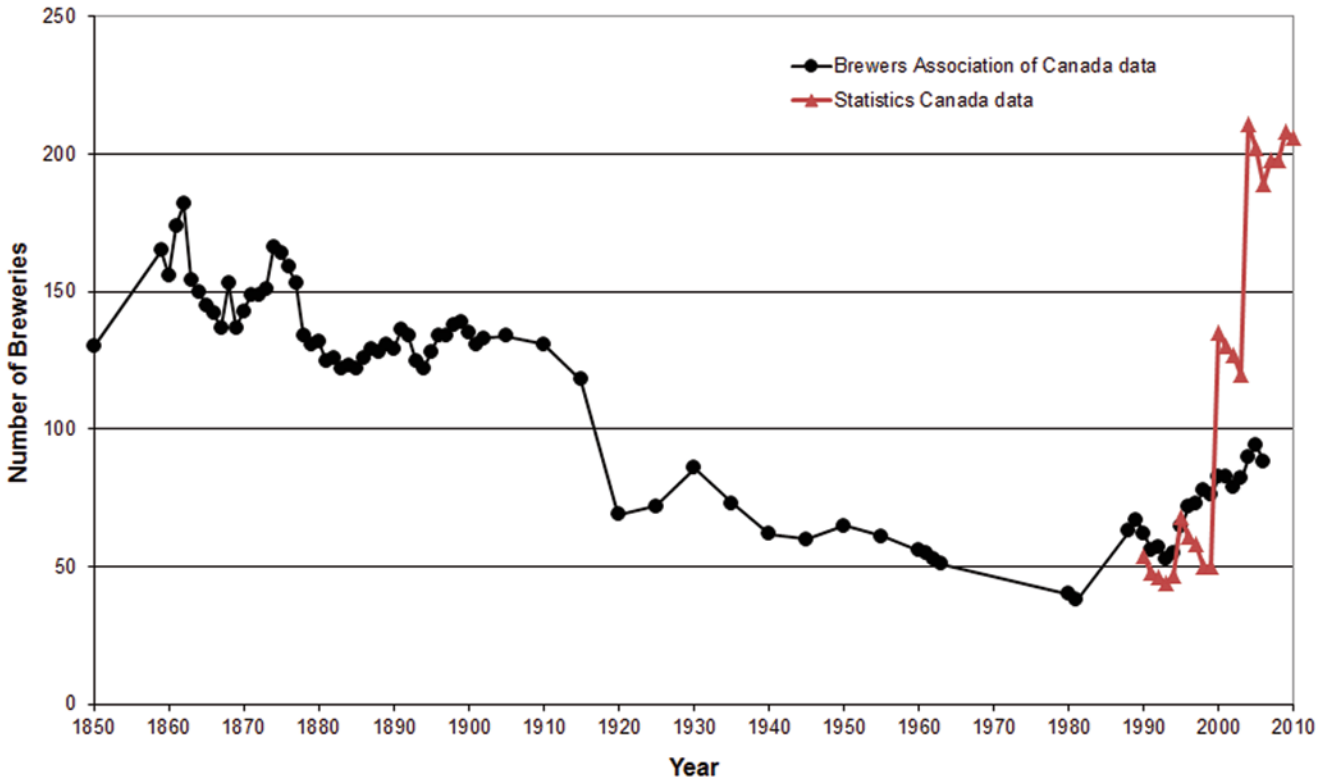

Fig. 16.2 Number of Breweries in Canada, 1850–2006. (Sources: Brewers Association of Canada 1965, 1999, 2003 and 2007; Statistics Canada CANSIM tables 301-0003 and 301-0006; The Western Brewer 1903)

companies (Labatt by InterBrew, now Anheuser-Busch InBev, and Molson with Coors), so that the national brands are not Canadian anymore.

In contrast to the U.S., where the largest brewing companies operated huge plants to serve the national market, the Canadian companies continued to operate the breweries they bought in dispersed locations in order to serve local markets with their standard products while avoiding inter-provincial trade barriers. Because of the replacement of local brands with fewer, more generic beers (principally lagers), Beaumont (1994) describes this period as the 'decline of distinction.' Even after the internal trade barriers came down, Molson and Labatt continued to operate multiple plants across the country, though they each closed some operations and consolidated their national production to a moderate degree. For example, both have closed their Winnipeg and Saskatchewan breweries, but continue to have plants in Alberta and Ontario.

As Paul Brent notes, Labatt and Molson had determined that "the [Canadian] beer business is much more about marketing than it is about brewing" (2004, p. 15). In other words, the brand was more important than the quality and distinctiveness of the product, and the brand had to be national. The big companies' success, one could argue, may well have been made possible by the fact that their identities were not tied to local places; each (including Carling O'Keefe previously) was named after the family(ies) responsible for founding it. In fact, through the 1950s, Canadian Breweries (which became Carling O'Keefe in 1973) fell behind Molson and Labatt partly because it was running a collection of regional brands, none of which gained national appeal, while the latter companies were dropping local brands and creating national ones (Brent 2004). Only much later did they begin again selling brands marketed on the basis of a geographical or regional identity (described below). At best during this period, the big companies attempted to create a national identity with their products (think Molson Canadian, the company's flagship brand) rather than building on existing local or regional identities with place. At a larger scale, Beaumont equates this process with "globalization, and in the world of beer, it means extricating flavours that might count as distinguishing characteristics so that the product may be more effectively sold on image alone" (2004). In a study of regional productivity differentials across the regions of Canada, Denny and May (1980) chose the brewing industry because, among other things, "product differentiation is minimal in terms of production in contrast to marketing" (p. 209).

By the 1980s, Canada was ready for the microbrewing renaissance. Led by a group of enthusiasts inspired by the British CAMRA (CAMpaign for Real Ale) movement, and in some provinces enabled by new legislation legalizing the new small breweries, microbreweries sprang up across the coun-

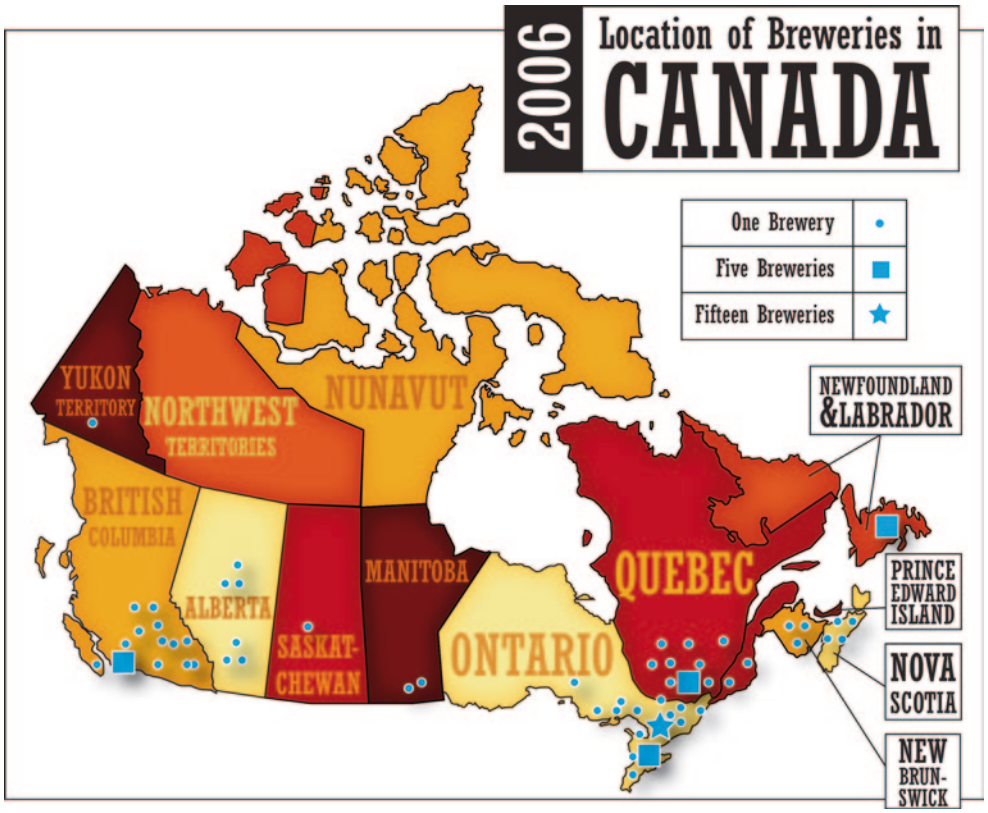

Fig. 16.3 The Location of Breweries in Canada, 2006. (Source: Brewers Association of Canada 2007)

try through the 1980s (Sneath 2001). These early microbrewing pioneers met with considerable success, and the trend accelerated in the 1990s. The first modern microbrewery in Canada was opened in British Columbia in 1982 (Horseshoe Bay Brewing near Vancouver), joined soon after by breweries in Ontario (Brick Brewing Company in Waterloo) and Alberta (Big Rock Brewery in Calgary) in 1984. By then the trend had solidified. By 1990, there were 62 breweries across Canada, of which 33 were new independent microbreweries (the other 29 included pre-renaissance independents as well as multiple plants owned by the larger national beer companies). Ten years later, this number had grown to 83, of which 58 were modern microbreweries. Growth accelerated in the early 2000s, and by 2010, Statistics Canada reported 206 brewing operations in Canada (see Figs. 16.2 and 16.3).[2]

Canadian Microbreweries and Neolocalism

Certainly, the new microbreweries have brought with them a sea-change in the availability and popularity of styles of beer available to the Canadian consumer. Some experts have even identified regional trends in taste: British styles in Atlantic Canada (the provinces of Nova Scotia, New Brunswick, Prince Edward Island, and Newfoundland and Labrador), Belgian styles in Quebec, mainstream or conventional styles in Ontario, eclectic flavours in British Columbia, and experimental styles in the Prairies (Manitoba, Saskatchewan, and Alberta) (Foster 2011). There is no doubt this is a very broad generalization, but there is some underlying truth to the idea that beers are associated with place in interesting ways.

The central premise of this chapter is that one of these interesting connections to place is in the manner in which microbreweries brand and market themselves and their products. According to Pike (2011, p. 8), "brands and branding embody an 'inherent spatiality.'" In particular, brands are used to convey multiple layers of meaning or values, and this can include an appeal to consumers' sense of identity. For many, this identity is inextricably tied to place. This underlies the widespread use of 'country of origin' marketing, for example. At the same time, the relationship between branding and place indicates that brands and marketing strategies can be understood differently by people in different places precisely because of the variation in meaning of cultural signals from place to place. The 'geographical entanglements' in which branding is embedded "can be of different kinds (e.g. material, symbolic, discursive, visual, aural), varying in their extent (e.g. strong, weak) and nature (e.g. authentic, fictitious)" (Pike 2011, p. 9).

Microbreweries, it appears, have enthusiastically embraced their connection to place in their branding and marketing strategies. Wes Flack uses term neolocalism to reflect

[2] See Eberts (2007) for a concise overview of the evolution of the brewing industry in Canada, or Sneath (2001) for a more comprehensive history.

this "self-conscious reassertion of the distinctively local" (1997, p. 38), and suggests that microbreweries are prime examples of the phenomenon. He argues that the new microbreweries, as agents of local identity, are part of a larger 'cultural countercurrent' that has emerged in resistance to the homogenizing forces of globalization and universal consumer culture. Other examples include farmers' markets, artisanal producers, and the 100-mile diet and locavore movements. Jordan-Bychkov et al. (2006, p. 428) similarly suggest this represents a rejection of the homogenizing forces of globalization in an era of mass produced, consumer culture, and a desire to "reembrace the uniqueness and authenticity of *place*."

Microbreweries are, by nature, local businesses. They operate on a small scale, so it is natural that they will serve primarily local markets. In the US, where some of the more successful craft brewers have attempted to expand their geographic reach from local, to regional, and sometimes to national and international markets, many found this strategy unworkable, and distant markets unprofitable. As a result, it was not uncommon in the late 1990s and early 2000s to see craft brewers pulling back from more expanded markets, and refocusing on local and regional markets[3]. If microbreweries appeal to local consumers, then this outcome was probably entirely predictable, as expansion into new geographic markets meant that those breweries were in direct competition with others with whom local consumers could more readily identify. In Canada, a smaller population distributed over a larger area has limited the attraction of the geographic expansion strategy, so this phenomenon has not happened at the same scale as in the US. Fewer microbreweries have attempted geographic expansion on a significant scale, and only the most competitive have succeeded. Interestingly, the craft brands that have overcome distance with the greatest success have tended to be ones that are not place-branded. For example, Sleeman, Canada's largest craft brewery has expanded from coast to coast (by buying other local microbreweries). Like the national brewing giants, Molson and Labatt, it is named after the family that founded it rather than anything geographically linked to its birthplace.

Nevertheless, the microbrewing industry is marked generally by branding and marketing strategies that are deeply rooted in place. This encompasses branding of both the breweries and their beers, and the manner in which these are marketed. Furthermore, many of Canada's microbreweries have become important players in local community activities and development. This chapter highlights a few of these aspects of neolocalism. The discussion of names that follows is based on a survey of beer companies and products conducted in 2005. At that time, 113 breweries and over 500 beer brands were identified. While there has been both growth and turnover in the industry since then, it is safe to consider the general pattern at that time, and in particular the contrast between microbreweries and the national brewing companies, to be consistent with the industry today.

Branding of the Company

Probably the simplest instance of neolocalism in the brewing industry is represented by the names of the brewing companies. As suggested above, the national brewers have succeeded partly because their identities are not explicitly tied to locations. While the families after which Canada's three biggest brewing companies are named may all have strong historical connections to particular locations (Labatt to London, Ontario; Molson to Montreal, Quebec, and Sleeman to Guelph, Ontario), this is hardly the same as the branding of the places themselves. On the other hand, microbreweries are very often named after the place they reside, from regional to very local in scale. At the larger end of the scale, some breweries are named for the region in which they are located: Vancouver Island Brewing, in Victoria, British Columbia, and Lakes of Muskoka Brewery in Bracebridge, Ontario are examples. Some breweries are named simply after the community they call home: examples include Nelson Brewing Company, in Nelson, British Columbia, and Niagara Falls Brewing, in Niagara Falls, Ontario. For yet others, the name refers to a locality at a smaller scale, such as a neighbourhood or even a street: examples include Dockside Brewing, located on the waterfront of Vancouver's Granville Island (a gentrified upscale commercial and residential district), Old Credit Brewing, in Mississauga, Ontario (Port Credit is the port and district around which Mississauga grew), and Mill Street Brewery in Toronto, Ontario (located on Mill Street, in the heart of a gentrified industrial district with a boozy past).

In addition to place names, many breweries are named after features of local geography: Creemore Springs Brewery, in Creemore, Ontario; Mt. Begbie Brewing, in Revelstoke, British Columbia; and Big Rock Brewery, in Calgary, Alberta (named after a well-known local glacial erratic—a 16,500 pound granite boulder deposited near the town of Okotoks, adjacent to Calgary, by ice during the last glaciation; it is claimed to be the world's largest known erratic) are notable examples.

Further neolocal elements can include reference to important historical events or features of the place: Fort Garry Brewing in Winnipeg, Manitoba, is named after the historic Hudson's Bay Company trading post which marks the origin of the

[3] At a panel discussion entitled "Can the Small and Microbrewer Survive?" held at the 1997 Annual Convention of the Brewers Association of America, Jim Koch, co-founder and chairman of the Boston Beer Company, stated: "What's happening in the segment now is a lot of retrenchment, by people who expanded optimistically, and are now pulling back into their core areas of strength, typically geographical. These companies are dropping salesmen in remote markets and pulling back into core areas" (Modern Brewery Age 1997).

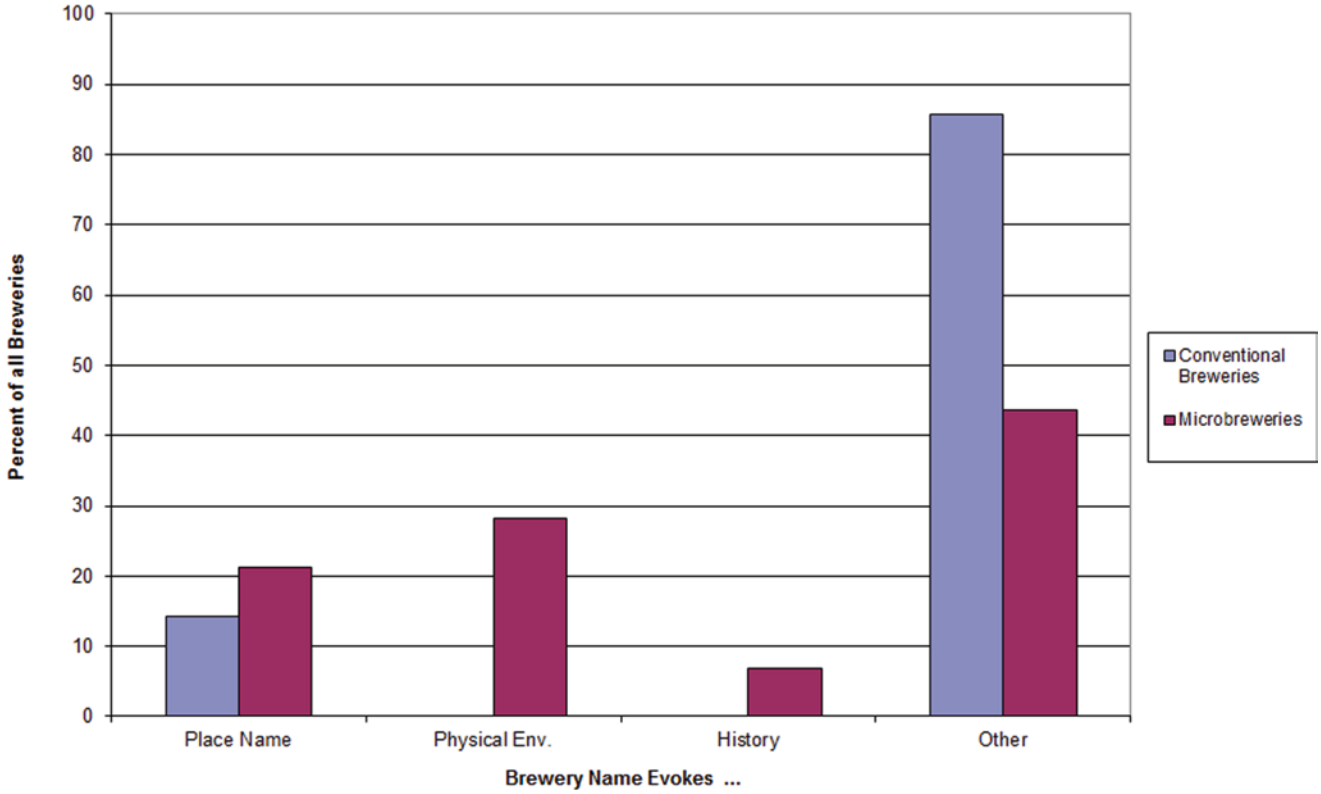

Fig. 16.4 Neolocalism and Brewery Names

city. Another Winnipeg microbrewery, Two Rivers, was named for related reasons. The Fort Garry post was located at the confluence of the Red and Assiniboine Rivers, making it ideally situated for the fur trade in the interior of Western Canada at the time. Coincidentally, Two Rivers has now been amalgamated with Fort Garry. Another example of historical connection, Steam Whistle Brewing, in Toronto, Ontario, occupies an old railway roundhouse. However, despite the prominent featuring of the steam whistle imagery in the company's branding, oddly the real origin of the name has more to do with the Flintstones than railways! Garrison Brewing Company of Halifax, Nova Scotia is named to recognize the city's roots as an armed fortification protecting a major harbour in Atlantic Canada.

In some cases, the naming may appear overly generic, and yet still reflect important aspects of local geography. Bear Brewing Company in Kamloops, British Columbia, and Tree Brewing in Kelowna, British Columbia refer to the general nature of the physical environment around those locations. The local ecology is an important component of place identity for Kamloops and Kelowna.

Undoubtedly not all microbreweries are branded in such obviously neolocal ways, but there is equally no question that microbreweries are much more likely to do so than larger brewing companies. If we divide Canada's breweries into the new-era microbreweries and the older conventional breweries (including the national companies), the following distinction can be made (see Fig. 16.4): just over half of the 111 microbreweries identified here have been named to reflect some aspect of local geography (place name, element of physical environment, or local history); only one plant owned by a conventional brewery could be considered to have a connection to place. The lone exception in the conventional category is the Labatt plant in Creston, British Columbia which continued to operate under the name Columbia Brewery long after Labatt purchased it in 1974.

Branding of the Beers

Next, consider the naming of the companies' products. Again, we can identify brands that are named to reflect local places (e.g. Old Yale Brewing's Chilliwack Blonde, after the town of Chilliwack, in which they are located; Brick Brewing's Waterloo Dark, again after the city in which they are located), physical environment (e.g. Trafalgar Ales and Meads's Harbour Gold or Port Side Amber; Northern Breweries' Red Maple Premium Lager), and local history/historical geography (e.g. Unibroue's Don de Dieu, named after the ship that brought Samuel de Champlain to Tadoussac in 1608; Quidi Vidi Brewing's 1892, named to commemorate the last 'great fire' of the 1800s in St. John's, Newfoundland). Although there is some branding of history by the conventional

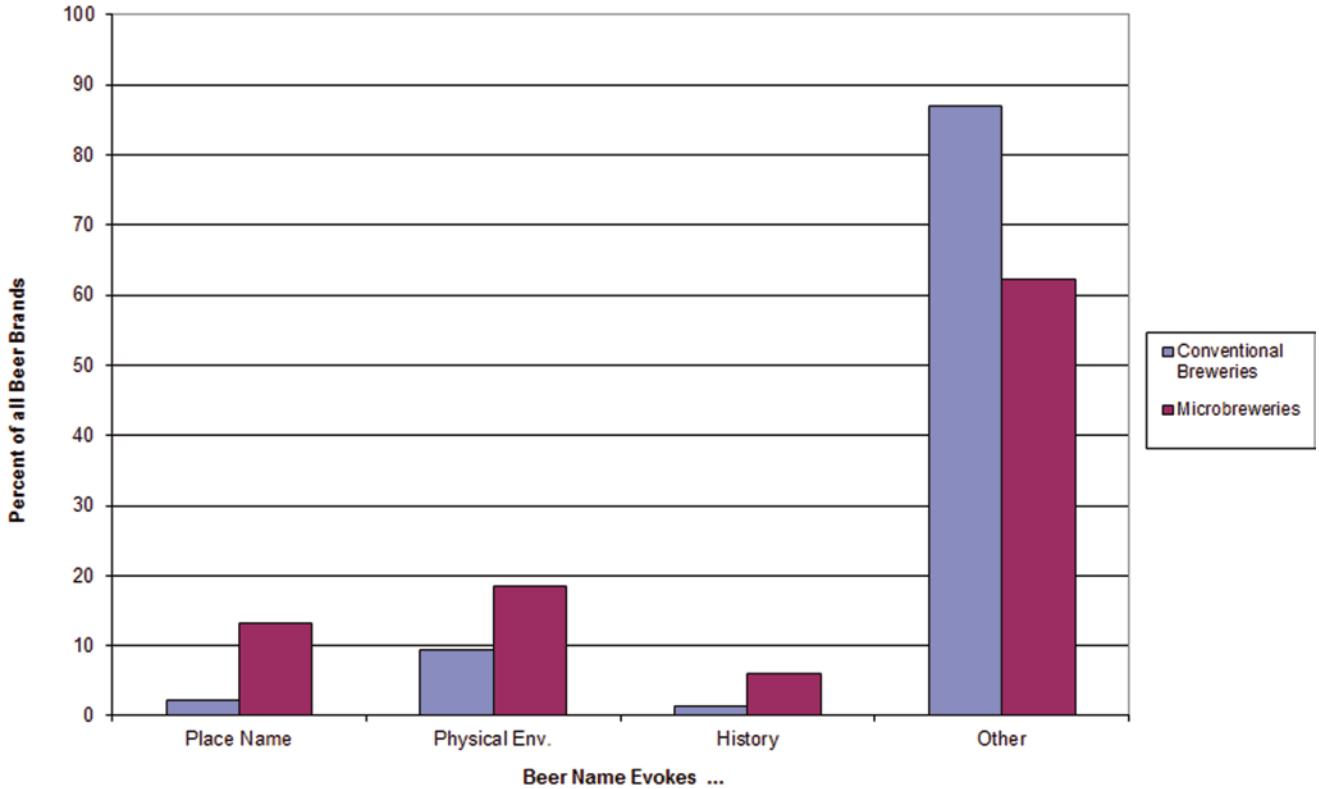

Fig. 16.5 Neolocalism and Beer Names

brewers as well, it does not always carry a geographical connotation. For example, Labatt's 50 was created and named to commemorate the 50th anniversary of the partnership between John and Hugh Labatt, grandsons of founder John K. Labatt—corporate history with no place-connection.

The distribution of neolocal vs. non-neolocal branding of 552 individual beers is summarized in Fig. 16.5. This time, the neolocal strategies of the microbreweries appears to have diminished, and of the conventional breweries to have increased (most notably in the physical environment category), but as a proportion of brands, microbreweries still easily surpass the conventionals in marketing place. The narrowing of the gap is due in part to a recent effort by the conventionals to take advantage of the microbrewing renaissance. The author also recognizes that the identification process was subjective, and it is possible that some brands may indeed have local meaning of which the author and his assistant are unaware. For this reason, the magnitude of neolocalism in beer brands is likely underestimated.

Other Ways Micros 'Connect' to Places

Microbreweries have developed neolocal strategies beyond the mere marketing of their business and products. At least three additional categories of local involvement are identified: the brewing of special event beers, tourism, and community economic development.

Big Rock of Alberta has become especially involved in brewing special beers for special events. In 2003, they brewed Bone Creek Centennial Lager for the Saskatchewan market, to celebrate that province's upcoming 100th anniversary in 2005. The name is derived directly from Wascana Creek, on which the province's capital city, Regina, is situated. Before it became a significant settlement, the place was known as 'Pile of Bones' because that is about all that was there. Wascana is derived from the Cree word for 'pile of bones.' Similarly, when Brandon, Manitoba celebrated its 125th anniversary, Big Rock won the contract to brew the commemorative beer, Assiniboine Lager, named after the Assiniboine River on which Brandon is located. Not only did they provide the specially branded product, but they also donated $ 1.00 from every case sold to a tree planting project to serve as a legacy to help beautify the community. Likewise, Battleford Centennial Lager was brewed in 2004 to help the town of Battleford, Saskatchewan celebrate its centennial, with $ 1.00 from every case sold being donated to support the Historic Battleford Lions Club Park. Notably, in the Brandon competition, neither of the national brewers bid on the job. Interestingly, Labatt and Molson were both regularly involved in such ventures prior to the microbrewing renaissance.

Like many (though not all) microbreweries, the special event product niche is part of a larger strategy of Big Rock to be actively involved in local communities. As their website's "In the Community" page states:

> Sure we've won awards and sold a few beers along the way, but we measure our success a bit differently. Success to us is being able to pitch in and support our community wherever we can. Our annual Eddie Awards raises fun and funds for some well deserving local charities. We support hundreds of various arts events across the country. When it's called for we have even created special beers for community fundraising efforts: Chinook Pale Ale raised money to help protect salmon habitat, while Canvasback Ale supported Ducks Unlimited (Big Rock Brewery n. d.).

No doubt the bottom line is still important, but Big Rock exemplifies the ways in which connecting to local communities is a key strategy for microbreweries.

Tourism has become an important component of the craft breweries' business model and increases their connection to local communities. Most microbreweries offer tours, both for marketing, but also to generally create tangible links with their consumers, or enable the consumers to feel a greater connection to them. The importance of this element of the craft brewery business model is exemplified by its promotion in Ontario. An early example, the Waterloo-Wellington Ale Trail was established in 1998 by a group of brewers in the Ontario counties of Waterloo and Wellington, a hotbed of the Ontario craft brewing movement (Plummer et al. 2005). The Ale Trail was to operate much like wine routes elsewhere—breweries would be identified and the public would be encouraged to engage in self-organized tours of the trail with visits to the breweries. Although successful, the Ale Trail was abandoned in 2003 (Plummer et al. 2006). More recently, the Ontario Craft Brewers (OCB), an organization formed in 2005 of about 30 of the province's microbreweries, has taken this idea to a larger scale, and created the Ontario Craft Beer Route. It is really a series of 5 routes, based on the OCB's division of the province into 5 'craft brewing regions', much the way provincial tourist boards divide provinces into distinct tourism regions. It is hoped visitors will "taste great beer, talk to a craft brew master and experience the culture of some of Ontario's local communities" (Ontario Craft Brewers n. d.). Their ties to place are an explicit part of their strategy to promote visitation to their plants.

In addition to providing increased sales to the breweries (of both beer and other company paraphernalia), brewery tourism also provides increased economic activity to the community—the brewery tour becomes an economic development strategy. In this way, the business is a key booster for the community. Some breweries, being well aware of this connection, take a very active role in community development initiatives. Creemore Springs Brewery, in the town of Creemore, Ontario, is an exceptional example of this involvement. The brewery itself occupies a renovated building on the town's Main Street. After languishing for many years, the town has effectively been revived based on the catalyst provided by the brewery. Located at the edge of one of Ontario's premier cottage regions, Creemore is now a thriving town with numerous upscale shops and art and craft galleries. The brewery was instrumental in this revival, even going as far as to provide architectural advice to other businesses seeking to join them in renovating Main Street buildings that had fallen into disuse (Brewers Association of Canada 2001). Today, much of Creemore's Main Street is testament to the success the town has had in this revitalization strategy. Indeed, Creemore was a key player in implementing for the town of Creemore the classic 'Main Street' approach to revitalization, based on heritage and tourism.

Response by the National Breweries: the Faking of Neolocalism

Realizing the potential of the new craft beer market, and noticing that the new microbreweries were eating into sales at the highest margin end of the market, the national breweries initiated several strategies to keep in the game. The easiest was to purchase microbreweries once they had become established and successful. Molson-Coors, for example, bought Ontario's Creemore Springs Brewery in 2005 (just after the data for this study were collected), and British Columbia's Granville Island Brewing in 2009. Unlike the post-WWII era of takeovers and acquisitions, these operations continue to function independently, and the microbreweries do not brew other Molson products. Contrast the case of Columbia Brewing Co. in Creston, British Columbia, which Labatt took over in 1974. In addition to continuing to produce brands unique to the newly acquired plant, Labatt added some of its staples, like Blue, to the Creston operation's lineup as well.

Another strategy has been to cultivate neolocal identities for products already in the companies' portfolios. Labatt, for example, began more aggressively marketing niche products it had acquired earlier. Its Kokanee lager, brewed at the Columbia Brewery since 1962, is now a flagship brand in Western Canada. It became an important brand in the Labatt portfolio when the company bought the formerly independent Columbia Brewery in 1974. Its marketing imagery (including packaging and advertising campaigns) relies heavily on its mountain identity, and for some time, Labatt even used the tag line 'Glacier Beer' to describe it, though no such style exists.

Alexander Keith's provides another example. Labatt product Alexander Keith's India Pale Ale was little known outside Atlantic Canada before the microbrewing renaissance, but is now promoted nationally. It is brewed exclusively at the Labatt-owned Oland brewing operation in Halifax, Nova Scotia, acquired in 1971. Oland had previously taken over the original Alexander Keith's brewery. In addition to

now marketing the beer nationally, the heritage of Alexander Keith's is also keenly promoted by Labatt. Moreover, the original Keith's brewery location adjacent to downtown Halifax is now a popular tourist destination. Though beer is not really produced there anymore, visitors are still welcome to take the brewery tour, showcasing the traditional brewing techniques which the original Alexander Keith's would have practised. However, this only occupies a small part of the original Keith's brewing grounds. The rest is now taken up with trendy upscale shopping, including a popular local farmer's market.

Molson also played this game, introducing its Rickard's Red brand in 1984 as the microbrewing renaissance was blossoming. The brand was originally labelled as being made by the Capilano Brewing Company. This historic British Columbia brewery was opened in 1934 in Vancouver, then taken over by Sick's in 1953, the latter being purchased by Molson in 1958 (Bigelow 2012). By the time Molson was promoting Rickard's Red as a premium microbrew, any trace of the Capilano Brewing Company was long gone, but this seemed the appropriate way to promote a premium beer. Rickard's Red has been joined by Rickard's White, Rickard's Dark, and Rickard's Blonde, as well as a handful of seasonal beers, all styles which are associated with microbrewing. Interestingly, Molson-Coors has dropped the Capilano Brewing Company from the label, obviously feeling that the local connection is less important than the premium style for marketing the beer (bars and restaurants routinely categorize the beer as 'import'—though it isn't—or 'premium' rather than 'domestic'). Nevertheless, the Molson-Coors connection is also well-concealed; the Rickard's website reveals only the faintest trace of the parent company's identity—in small print, in a faded font at the bottom of the page (Rickard's n. d.), whose hyperlink points back to the Rickard's homepage.

Vancouver's Granville Island Brewing illustrates nicely the contrast between truly local breweries and the national beer corporations' attempts to replicate the phenomenon. Originally an independent microbrewery, GIB was a classic case of neolocalism. The brewery is, of course, named after Granville Island, a revitalized neighbourhood in Vancouver. Located in False Creek, adjacent to downtown Vancouver, the island was once industrial, but has become a trendy shopping and residential district. The brewery was opened in 1984 and is one of the pioneers of the microbrewing renaissance in British Columbia. A number of GIB's beers are also branded to reflect local geography: English Bay Pale Ale, Gastown Amber Ale, Kitsilano Maple Cream Ale, Island Lager. Their Robson Street Hefeweizen is a German style wheat beer, and its name was carefully chosen. As the reverse label used to read:

> Robson Street was once known as Robsonstrasse, a charming street lined with German shops and delis. With such strong German roots, our Bavarian Hefeweizen (Hay-fuh-vy-tzen) seemed like the perfect tribute to Vancouver's ultimate people-watching destination.
>
> This unfiltered wheat ale goes well with sizzling summer days, so find yourself a patio and pull up a chair. Enjoy Hefeweizen chilled in a tall, slim glass, and although our brewmaster may scoff, a lemon wedge is the perfect accessory to the natural fruit flavours of this refreshing beer.

The beer drinker just got a free geography lesson! However, after GIB was taken over by Molson-Coors in 2009, the labelling for Robson Street Hefeweizen was changed (as it was for all GIB's brands). The graphics were updated, but more pertinent to the argument here, the explanation of the geography has been omitted. The label now reads:

> This unfiltered wheat ale is a West Coast favourite. Enjoy ROBSON ST. HEFEWEIZEN chilled in a tall, slim glass and although our brewmaster may scoff, a lemon wedge is the perfect accessory to the natural fruit flavours of this refreshing beer.

Perhaps it is only coincidence, but it seems the Molson-Coors version of the brand is somehow less neolocal than the original.

The Bastardization of Neolocalism

One beer company deserves special mention in a discussion of neolocalism in branding and marketing. Calgary-based Minhas Creek Brewing Company, founded in 2002, would appear to be named after a local geographic feature, but in fact, there is no Minhas Creek. The name was simply based on the surname of the owners (brother and sister team Ravinder and Manjit Minhas). The company does market uniquely in several regions: their 'classic lager', for example, is branded Minhas Creek in Manitoba and Saskatchewan, Mountain Crest in Alberta, and Lakeshore Creek in Ontario. The packaging in each market looks identical, apart from the name. And the text on the can reads, in part, "Minhas Creek Classic Lager Beer starts as pure, clean water from deep within the 500 million year old Canadian Shield." Clearly the brand is attempting to give the appearance of a truly neolocal craft beer.

Not only is the geographic connection fabricated, but it turns out the beer is not even made in Canada. The company really started as a marketing operation rather than a brewing operation. And despite the prominent use of the maple leaf on its packaging, particularly of the classic lager brands, Minhas Creek is brewed in Monroe, Wisconsin—initially by contract to Joseph Huber Brewery, which Minhas subsequently bought in 2006 and renamed Minhas Craft Brewery. So indeed, those waters may lie beneath the Canadian Shield, but not in Canada. The company is especially attentive to creating the image of being local in several different markets. Although originally an Alberta company, they created a new image for themselves as they expanded to Saskatchewan and Manitoba. The company maintains unique websites targeted to consumers in each province, and the promotion of their 'identity' is interesting: on the Saskatchewan website, they

state "Minhas Creek Craft Brewing Company is 100% Canadian owned and operated and we are based in Regina, Saskatchewan;" meanwhile, the Manitoba version of the website proclaims "Minhas Creek Craft Brewing Company is 100% Canadian owned and operated and we are based in Winnipeg, Manitoba" (Minhas Creek Brewing Company n. d.). This author believes the term 'bastardization' is an appropriate way to describe the Minhas Creek approach to neolocalism, as it fundamentally violates all the meaning implied by 'neolocal': authentic, familiar, and connected to place.

Conclusion

Following modest beginnings in the nineteenth century, when every beer and every brewery was local, Canada's modern brewing industry went through a dramatic consolidation in the mid-20th century. One major consequence was the emergence of a small number of national companies and brands which gradually shed all ties with local communities and places. The microbrewing renaissance of the 1980s onward reversed this trend. The new craft breweries often embraced local identities, and are demonstrably more connected to places (regions, communities) than the big national brewing companies. The latter have responded with a variety of strategies meant to help them compete in the craft segment of the beer market, but for the most part, they simply don't build on place-ties in the same way that the microbreweries do. The latter, after all, are genuinely local businesses. Their neolocal strategies of branding and other means of building (on) local identity are arguably a key component of their success, in addition to brewing good beer.

The data and conclusions presented here are admittedly cursory, and have not addressed fully the richness of neolocalism. For instance, the marketing of beer includes much more than just the naming of companies and products. Advertising campaigns and product packaging also offer rich terrain for further examination of the invocation of geography and place by breweries. Further research could usefully explore the motivations of the micro (and conventional) breweries' owners and marketers in developing their brands and marketing strategies. Likewise, consumer behavior research could help determine whether local identity is genuinely informing purchase decisions. Broad trends in the continuing evolution of the industry in Canada are worth exploring further as well. For example, while previously, the national brewing companies took over and assimilated local breweries and their brands, the recent trend seems to be for them to preserve the independent operation of the small breweries they acquire (examples described above). This is deliberate. Meanwhile, some of the larger new-era microbreweries are expanding nationally the way the conventional breweries did in the 1940s, '50s, and '60s. Ontario's Sleeman, for example, has acquired Maritime Brewing in Halifax, Upper Canada Brewing in Toronto, and Okanagan Springs in British Columbia. Interestingly, this new wave of takeovers is very different in character and impact as compared to that of the mid-20th century. Sleeman itself, in addition, has been acquired by Japan's Sapporo, making it a 'local' brewery with a national portfolio and international ownership. The Canadian brewing industry is continually evolving, and these patterns and processes deserve greater scrutiny.

Nevertheless, microbreweries continue to appeal to people's sense of identity with place, as much as with the quality of the products. As Papadopoulos suggests, consumers draw on both intrinsic (e.g. technical qualities) and extrinsic (e.g. price and brand) characteristics of products when making purchasing decisions. Since intrinsic cues may be hard to assess, especially early in the product or company's life-cycle, "buyers more often than not turn to extrinsic cues such as PI [place identity], for help" (Papadopoulos 2011, p. 28). Microbreweries are successfully capitalizing on this. In contrast to the generic, standardized approach which the conventional brewers used to transform Canada's brewing industry and culture of consumption, "[m]uch of the appeal of a microbrewed beer is that it is a rejection of national, or even regional, culture in favor of something more local" (Flack 1997, p. 49). This seems consistent with the oft-touted claim that today's globalized world is characterized as a fragmented, post-modern, post-consumerist society. As Schnell and Reese put it, "[i]f you want to support your local community, its individuality, and to stop the relentless steamroller of bland, uniform mediocrity that our consumer society foists upon us, you could to far worse than to quaff a pint at your local brewpub" (2003, p. 66).

Acknowledgements There is no single source that lists the names of all breweries and their products in Canada. The inventory of names used here was drawn from numerous sources, including the membership of the Brewers' Association of Canada and several online blogs. Only those breweries whose existence could be verified were included. For the names of products, an extensive search of the breweries' own websites was conducted to identify as many individual brands as possible. Many thanks to Mr. Pieter Good for assistance with this job.

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Offline Brews and Online Views: Exploring the Geography of Beer Tweets

17

Matthew Zook and Ate Poorthuis

Abstract

This chapter analyzes the distribution of geocoded social media data (also referred to as a cyberscape) that references "beer" and related terms. Drawing upon an ongoing research project that archives every geocoded tweet in the world, this chapter explores differences in the frequency and geographic distribution of the everyday commentary made by Twitter users about beer. While the sheer volume of activity, close to a million geocoded beer tweets in 2012, is notable in its own right, it is only when comparisons between subsets of the data are made that the most intriguing spatial patterns emerge. In order to showcase these patterns of differences within online social media, this chapter compares beer tweets to twitter commentary on other topics, *i.e.*, contrasting the geography of wine and beer tweets as well as examining differences within the online conversations about beer, *i.e.*, how do references to light beers or regional "cheap" beers vary over space. These geographical differences (e.g., where are the hot spots for "beer" vs. "wine" or "Bud Light" versus "Coors Light") illuminates how the commentary and views expressed online, reflect offline practices and preferences. In short, the visualization of "beer space" produced by mapping tweets represents the complex intertwining of offline preferences for specific brews which are expressed via an online practice of presenting ones views.

Introduction

The interconnection between physical space and informational space has expanded by leaps and bounds over the past decades. The rise of personal computing in the 1980s, the emergence of the commercial internet in the 1990s and the growth of mobile communication in the 2000s have contributed to the steady integration of digital information into the practices of everyday life. Increasingly cities are subject to what Thrift and French (2002) characterize as the "automatic production of space" in which information and software are inextricably bound up in making things work. From the lowly microchip that controls the movement of elevators to sophisticated traffic congestion pricing systems, information is an integral part of today's cities (Graham and Marvin 1996). Kitchin and Dodge (2011, p. 198) extend this understanding to the spaces of the home and even farm with their conceptualization of "code/space" in which 'code dominates the production of space' and review the multiplicity of ways in which information procession software tracks the production and movement of everything from eggs to music.

The increasing integration of information and software into everyday life has had a direct impact on both the discipline and daily practice of Geography. Geographic positioning systems (GPS) systems, free online mapping (such as those offered by Google) and the popularity of powerful and mobile smart phones have greatly impacted the availability of mapping and spatial awareness across the general public (Graham and Zook 2013; Graham et al. 2013). Whereas early generations were accustomed to static maps and spatial data distributed by experts, today's world has seen the democratization of mapping, i.e., everyone can be engaged in creating spatially referenced information and visualizations.

M. Zook (✉) · A. Poorthuis
Department of Geography, University of Kentucky, 817 Patterson Office Tower, Lexington, KY 40506-0027, USA
e-mail: zook@uky.edu

A. Poorthuis
e-mail: ate.poorthuis@uky.edu

M. Patterson, N. Hoalst-Pullen (eds.), *The Geography of Beer,* DOI 10.1007/978-94-007-7787-3_17,
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This phenomenon was labeled volunteered geographic information (VGI) by Goodchild (2007) but has also been termed neogeography, digiplace and the geoweb (cf Zook and Graham 2007; Graham 2010). Regardless of the name, a key point that is universally highlighted is the ability for individuals to become not simply consumers of maps, but active and engaged producers of spatial data and visualizations.

The cartographic empowerment of individuals includes the now mundane act of a spatial search for nearby amenities, the unconscious creation of digital trails left by mobile phones as well as the purposeful creation of new content via reviewing a business or store. Increasingly the practice of spatial tagging has crept into the use of online social media, e.g., Facebook, Foursquare, Twitter, etc., so that ordinary comments or "status updates" are labeled with the physical location at which they were created. This practice of geotagging social media provides unparalleled insight to the daily spatial movements of millions of individuals and moreover also offers a glimpse at what they are doing and thinking at the time. To be sure, there remain considerable issues with user generated, geotagged social media data, ranging from long standing concerns of representation (Pickles 1995) to newer critiques highlighting the spatial and social biases within the supposedly ubiquitous process of VGI (Crutcher and Zook 2009; Haklay 2013). These issues, however, do not mean that one should not seek to use geocoded social media data to answer spatial questions, rather they advise an awareness and cautious sensibility in the types of questions asked, the scale at which they are asked and the way in which results are interpreted. To this end, this chapter reviews one form of social media, geocoded Twitter tweets, to provide an initial exploration of the geographies of user generated commentary about beer in the United States.

Building upon the idea of cyberscapes, spatially references online information about the material world (cf Crutcher and Zook 2009), this work leverages an ongoing research project at the University of Kentucky that collects every geocoded tweet in the world. While the sheer volume of activity, close to a million geocoded beer tweets in 2012, is notable in its own right, it is only when comparisons between subsets of the data are made that the most intriguing spatial patterns emerge. In order to showcase these patterns of differences within online social media, this chapter compares beer tweets to twitter commentary on other topics, *i.e.*, contrasting the geography of wine and beer tweets as well as examining differences within the online conversations about beer, *i.e.*, how do references to light beers or regional "cheap" beers vary over space. These geographical differences (e.g., where are the hot spots for "beer" vs. "wine" or "Bud Light" versus "Coors Light") illuminates how the commentary and views expressed online, reflect offline practices and preferences. In short, the visualization of "beer space" produced by mapping tweets represents the complex intertwining of offline preferences for specific brews which are expressed via an online practice of presenting ones views.

Data and Method

The data for this study are drawn from the DOLLY (Digital OnLine Life) Project a database and software system customized from open source software to archive geotagged social media, particularly more ephemeral forms. Housed at the University of Kentucky, DOLLY runs on cluster of dedicated virtual servers and via the Twitter API ingests all geotagged tweets (approximately 8 million a day) provides researches the means to conduct real-time searches throughout the entire database. The DOLLY project has been operational since December 2011 and since that time has collected, indexed and stored every geotagged tweet in the world, approximately 5 billion tweets as of September 2013. In addition to a robust and stable back-end, the DOLLY project includes a user-friendly front-end to allow for easy exploration and analysis of the data. In the current iteration, researchers can search the database full-text in real-time, visualize the results spatially and temporally and export the results as a text file for further analysis off-line in dedicated statistical and geospatial software such as R or ArcGIS. While the data are presently restricted to geotagged tweets, the framework in place can easily be leveraged to include other sources as well.

Using the DOLLY user interface, this chapter extracted four different subsets of geocoded Twitter data:

- Tweets that contained either the keyword "wine" or "beer";
- Tweets that contained the keywords associated with a range of light beers, e.g., "Bud Light" or "Coors Light";
- Tweets that contained the keywords associated with a range of "cheap" brands of beer, e.g., "Budweiser" or "Saranac" AND the term "beer"[1]; and
- A random selection of all Tweets that was used for normalization.

The tweets were limited to those sent between June 2012 and May 2013 to represent a full year of data and control for seasonal variation. Only tweets that matched the keywords exactly (discounting capitalization) were collected and to simplify possible language effects, only tweets made in the United States were collected. To simplify visualizations, only the lower 48 states were used. For most keywords the full population of geocoded tweets was used, but for the terms "beer" and "wine" a ten percent random sample,

[1] The Boolean search "AND beer" was included in order to ensure that the gathered tweets were specifically referencing beer. A visual examination of tweets without the Boolean parameter showed that some keywords, *e.g.,* Lonestar, Olympia and Hudepohl, were finding a high level of non-beer tweets relative to other beer brand keywords.

which still produced datasets with hundreds of thousands of observations, was utilized instead to make data handling and processing easier.

The resulting datasets consist of point level data that record the location from where each tweet was sent. The visualizations presented in this chapter are created by treating each specific keyword as a separate point pattern process that is smoothed using a Gaussian kernel density over a rectangular grid (800 by 800 cells or 640,000 cells that are each approximately 0.07 decimal degrees wide and 0.03 decimal degrees high) for the entire continental US (cf Diggle 1985, 2003).

The result of this process is an 800 by 800 grid with each cell value containing the intensity of each point pattern. In order to correct for the spatial differences in the total level of Twitter activity, i.e., places with large populations have many more tweets than sparsely populated areas, each gridded point patterns is normalized by the a random selection of all tweets that is first processed, i.e., turned into an intensity grid, in the identical manner as each keyword. An odds ratio is calculated for each grid cell in each keyword where a ratio with a value of 1 indicates that there are as many data points for a keyword as expected from a random sample and scores greater than 1 indicate more points than expected. A 99.5% confidence interval is calculated for each cell and only cells that have a statistically significant odds ratio greater than one are included in these single keyword point pattern maps. Often sparsely populated locations (the Great Plains and Mountain states) or sites of relatively few beer-related tweets (the Southeast) did not meet statistically significant thresholds and are therefore not classified in some of the maps. To combine multiple keyword maps into a single visualization of regional variations, a clustering procedure based on iterative migrating means (often referred to as ISODATA) is used (Ball and Hall 1965). Cells that are caught in overlapping clusters are assigned categories using the results of the ISODATA clustering as input (a priori distribution in Bayesian terms) for a maximum likelihood classification that assumes a normal distribution for each class and uses the variance/covariance matrix for each cluster to determine the probability for each cell of belonging to a certain cluster. The cell assignment is based on which cluster has the highest probability.

Cyberscapes of Beer References on Twitter

The following maps of beer cyberscapes (aka the geographies of beer references with Twitter) illuminate hot spots and differences within online social media conversations about beer. These visualizations provide a compelling example of the linkages between offline and online practices and demonstrates how cyberscapes can provide insight on material geographies.

Wine Versus Beer

Although beer has long been the preferred alcoholic drink within the United States, a recent Gallup poll reveals that Americans are almost evenly split between beer and wine as their drink of choice (O'Donnell 2013). This near identical set of preferences at the national level, however, obscures geographic differences in consumption at the state and regional levels. While it is beyond the scope of this chapter to explain spatial differences in beer and wine preference, likely factors drawn from economic geography theories include physical proximity to sources of wine and beer production, income constraints as well as cultural preferences towards one drink or the other. Previously work on the geoweb demonstrates that these spatial differences in attitudes towards beer can be ascertained by examination of the geosocial media dimensions of this activity (FloatingSheep 2010, 2012). Thus, the first step in this chapter is examining the spatial variation of tweets containing the keywords "wine" and "beer" (see Fig. 17.1).

The geographies that emerge from this analysis provide useful examples of how online activity is reflective of offline practices. While there are large parts of the United States that remain unclassified (shaded in the lightest gray)—notably much of the Mountain West and Great Plains, the upper peninsula of Michigan and northern Maine—these areas have both low population densities and relatively little twitter activity. The remaining parts of the U.S., however, provide valuable insights on the regional differences in attention towards wine and beer. The darkest gray areas, which signify a greater preponderance of "wine" tweets, are concentrated in the wine growing regions of Washington and Oregon as well as northern and central California. This is relatively predictable as the wine industry is an important economic activity in these regions and thus would be the subject of tweets. Moreover, these regions represent major markets and consumption areas for wine in the United States (Lamy 2012).

On the opposite coast are also clear concentrations of high propensities to tweet about wine including the broader megalopolis region stretching from southern New Hampshire through Boston and New York before ending in the greater Washington DC area. This wine zone also extends into much of upstate New York, also an important wine growing region. Florida, Atlanta, New Orleans and the region around Memphis and Jonesboro area represent other clusters of wine tweeting. Most of these concentrations, particularly the megalopolis region, correspond with important wine markets (Lamy 2012) and the areas in between, shaded a medium gray, indicate an equanimity in tweets about beer and wine. In short, the bicoastal regions of the United States are more partial to wine, or more specifically, have a greater intensity of wine tweets, than beer.

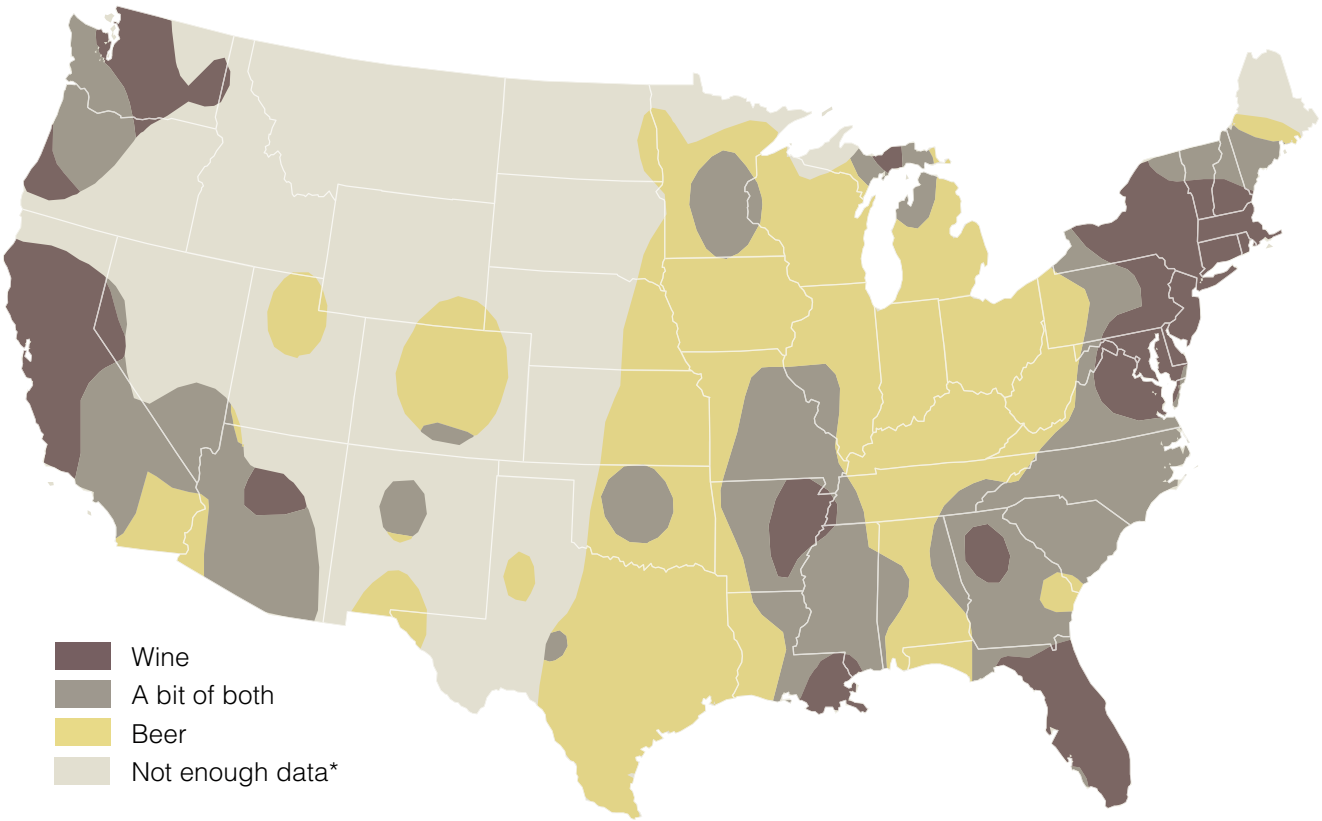

Fig. 17.1 The geographies of wine and beer tweets

In contrast, much of the Midwest—stretching from Eastern Pennsylvania to Minnesota—and the West South Central region—including Kansas, Oklahoma and Texas—is much more likely to be the source of beer-related tweets. Parts of this region, particularly the upper Midwest states such as Wisconsin and Minnesota, were settled by European immigrants from Northern and Central Europe and have a strong cultural tradition of beer brewing and consumption. Indeed, a later map of "cheap" regional beers (see Fig. 17.3) shows areas with an affinity for a particular brand. Smaller clusters also emerge, including the front range of the Rocky Mountains particularly the Denver-Boulder area, the greater Salt Lake City region as well as the southern border regions opposite of Ciudad Juarez and Tijuana including the city of San Diego. The one major exception to this pattern of more beer tweets in the interior of the country is the Mississippi valley region beginning in New Orleans and extending as far north as parts of Missouri that shows a more equivocal pattern between wine and beer.

It is worth remember that this analysis is based activity in informational space, i.e., sending tweets, rather than data based on material actions or stocks, and spatial differences in how beer and wine are referenced, *e.g.*, similar to how pop, soda and soft drink are used in parts of the country, may be coloring the findings in this map. Nevertheless, the pattern that emerges is largely consistent with offline historical, cultural and economic practices related to wine and beer and provides a persuasive example on how the digital and material dimensions of everyday life are co-evolving and reflective spaces.

The Spatiality of Light Beer

Expanding from the comparison between beer and wine tweets, this section examines geographical differences within social media about different kinds of beer. While any numbers of sub-categories could be used, in 2012 four out of the top five selling beers, as measured by sales, were light beers (DBJ Staff 2013) and as such represent an important area of study. Moreover, the popularity of light beers also translates into a larger social media presence, simplifying visualization and ensuring a smaller amount of unclassified areas. Thus, the map here illustrates the geography of tweets containing the names of the most popular light beers in the U.S., Bud Light, Coors Light, Miller Lite and Busch Light. While this is likely related to geographic market shares, we cannot and do not make this direct connection between tweets and sales, as the latter data are not available. Likewise, we do not categorize or measure the sentiment expressed in Tweets towards

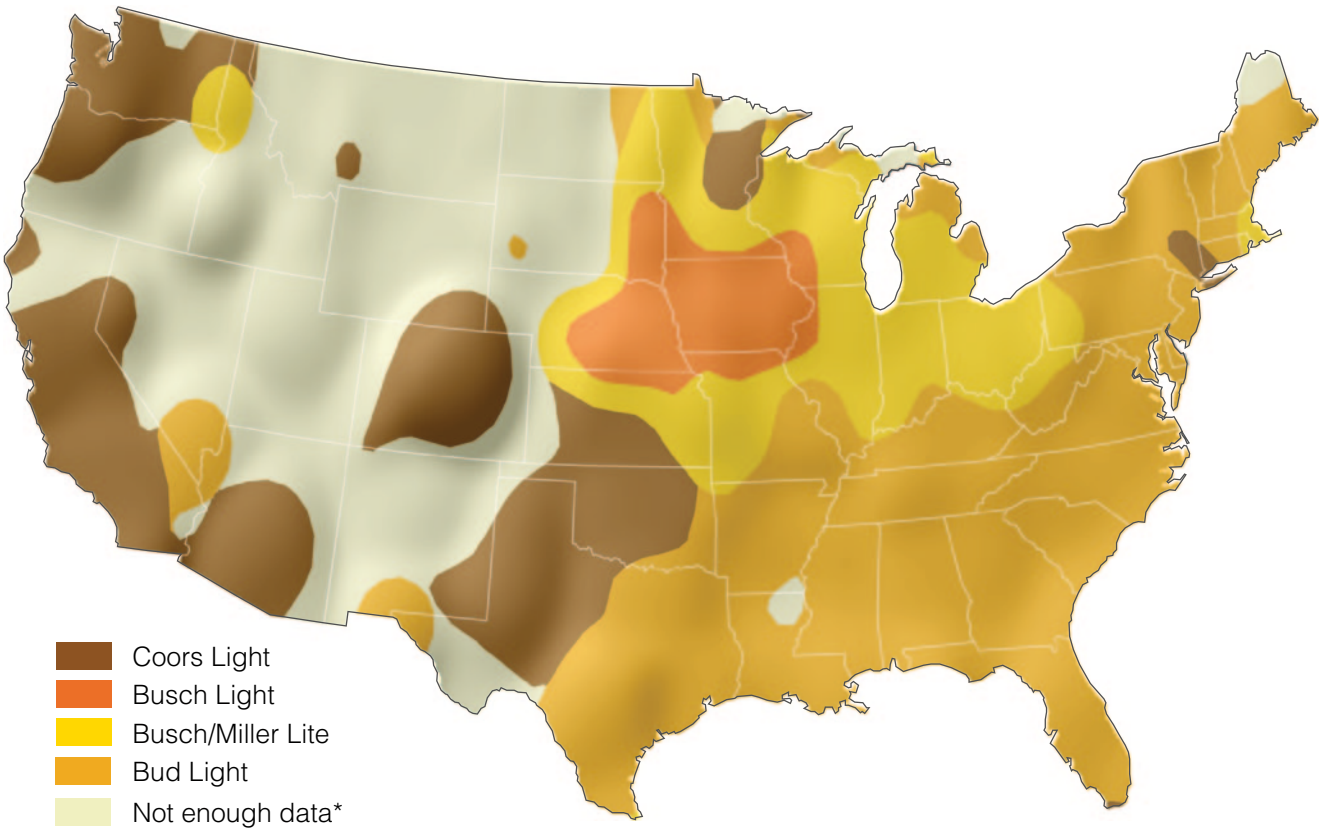

Fig. 17.2 The geographies of light beer tweets

any of these brands, positive or negative, but simply marks the mention of a particular name. Therefore this map is best interpreted as a measure of the level of attention within Twitter to a particular brand relative to other light beers.

The geographies of light beer tweets (see Fig. 17.2) provide a compelling picture of the variation in attention to various brands. The most obvious pattern is that the two largest brands, Bud Light and Coors Light, dominate the light beer cyberscape of the United States which is hardly surprising since their combined sales dwarf the other two beers by a ratio of 2.5 to 1. Moreover, the geographies of these two brands have a clear spatial divide with Bud Light dominating the more densely populated East Coast and Southern U.S., while Coors Light is largely clustered in the Western U.S. This geography is likely tied to both issues of market share—Bud Light had $5.9 Billion in sales compared to Coors Light's sales of $2.3 Billion—and history as Coors was founded in Golden Colorado where it continues to maintain its headquarters. It would seem probable that in addition to the Colorado region highlighted in the map as an area of higher attention to Coors Light, that much of rest of the Mountain West would share this categorization. However, these areas are lightly populated, which equates strongly with low levels of tweeting activity, and therefore remain uncategorized in this map in a repetition of the classic "interior unknown" labels of nineteenth century colonial maps. A reminder of some of the limitations of social media, most notably that its use varies across space and society resulting in unrepresented spaces and peoples.

While exceptions to the broad pattern of Bud Light in the East and South are evident—tweets about Coors Light prominent in the New York City region—the overall geographic divide is relatively consistent. A regional outlier, however, is the upper Midwest which emerged as a key beer region in the wine versus beer analysis (see Fig. 17.1). In this area, stretching from western Pennsylvania to eastern Nebraska, a different set of brands emerge as receiving more attention within Twitter. While Busch Light and Miller Lite are owned respectively by the makers of Bud Light and Coors Light, these brands emerged from different histories equipped with their own set of customer loyalties and market strategies. While the exact ways that these brands compete and differentiate themselves from their larger market share cousins is beyond the scope of this chapter it is evident that they possess their own unique geographies of tweets that can be differentiated from the more dominant brands. Despite the dominant market shares of the most popular light beers and ongoing industry consolidation, the cyberscapes of light beer in the United States shows that regional differential between mass market beers remains even with online social media. Moreover, as we consider more niche beers and markets, increasing complicated cyberscapes of beer emerge.

Uncovering the Geographies of Regional "Cheap" Beers

The final step of this analysis is visualizing and analyzing the competing and overlapping cyberscapes of a number of affordable (aka cheap) beer brands in the United States. A selection of national (Budweiser and Coors), widely distributed imports (Corona and Dos Equis) and more regional beers was chosen to explore the varying contours of visibility in social media that each of the brands enjoyed. In order to ensure that the tweets were referencing a product of a brewery rather than just a last name or place name, the term "beer" was also required to be present for a tweet to be added to the dataset.

It is important to note that the selection of keywords does not represent the complete range of beers on offer in the U.S. but instead draws inspiration from a recent magazine article about the ongoing consolidation of the beer industry as large corporations buy up historically independent breweries (Salon Staff 2011). The article is also the source for the list of beers included in this mapping exercise. One could undertake a similar exercise with other lists, e.g., emerging craft microbrews, styles of IPAs, etc., but given this research's focus on ties between digital social media and offline material presences it is useful to limit keywords to more traditional brands of beer as they enjoy decades of cultural presence in their locale.

We first examine the individual point pattern grid of tweet intensity for eight different beer brands grouped in rough pairs of a) brands with large sale volumes, b) Mexican imports, c) Midwestern regional brands and d) East coast regional brands (see Fig. 17.3). First, picking up from Fig. 17.2 and its aggregated pattern of light beer tweets, we extract the specific cyberscapes for Bud Light and Miller Lite. While Bud Light shows an intensity of tweets in much of the Eastern half of the U.S., Miller Lite is heavily and almost exclusively concentrated in the Midwest and Great Plains, mirroring the depiction in Fig. 17.2. This transition between individual and aggregated visualizations of beer tweets provides a useful guide for interpreting the rest of the single brand maps in Fig. 17.3 and the aggregated composite in Fig. 17.4. The next pair of maps showing the Mexican imports of Corona and Dos Equis both show a clear concentration along the border although Dos Equis has considerably more spread in both in the southwest as well as other parts of the country than Corona. Shifting focus to the Midwest with the next set of maps, there is a clear hotspot for Grainbelt around the Twin Cities in Minnesota and Goose Island possesses a cyberscape centered on Chicago and extending into nearby states. The final pair of maps feature Sam Adams with a cyberscape centered around its headquarters in Boston and Yeungling with strong concentrations of tweets around its operations in Pennsylvania and Florida.

It is also illuminating to aggregate individual beer cyberscapes into one common map to illustrate the complicated and overlapping spaces of beer tweeting. Given the diversity in the size of market shares of the brands under analysis, the method for this map focuses on the relative intensity of references to a beer rather than the absolute number of references. Otherwise, an aggregated map would look very similar to Fig. 17.2 with major brands like Coors and Budweiser dominating overall, and medium sized operations, e.g., Sam Adams, eclipsing the smaller breweries in certain local markets. Focusing on the localized intensity of a brand's cyberscape allows for better insight on the resulting geographies of attention across a range of market shares. In addition, rather than categorizing any particular location as solely the province of one brand, the visualization presented here allows for overlapping cyberscapes. The result is more difficult to interpret (see Fig. 17.4) but that is intentional as it demonstrates the complexity of beer cyberscapes, particularly in regions such as the Midwest and Northeast in which multiple and competing local beers were included.

Starting in the West, one sees the cyberscape of Olympia Beer in the greater Seattle area as well as Corona in Southern California. This latter effect is largely the result of relatively few Twitter references to the one California "cheap" beer included in this dataset, Lucky Lager, which has largely disappeared from its historic place of origin. Moving eastward, one sees the cyberscape of Coors centered on Colorado, again in part an artifact of the relative limited selection of beer brands, while Corona and Dos Equis have largely over-lapping polygons in southern Arizona. Texas displays a similarly complicated set of cyberscapes with Dos Equis and Lone Star sharing largely similar contours with Budweiser emerging at the southernmost tip of the state.

The band of territory from Minnesota to Massachusetts marks the most complex set of overlapping boundaries starting with Grainbelt centered on Minnesota before moving to the dense and convoluted polygons, representing Schlitz, Old Milwaukee and Milwaukee's Best, that blanket Wisconsin and extend south and east across Illinois, Indiana and Michigan. In addition to its national presence, Budweiser continues to possess a particularly dense cyberscape around St. Louis, while the Hudepohl brand has a similar manifestation around its headquarters in Cincinnati. Immediately to the east of Hudepohl one notes the increased number of tweets about Yeungling which also skips across distance to also be represented in Florida where it also has a brewery. Continuing eastward there is the cyberscape of National Bohemian centered in Maryland, as well as the presence of Genesee and Saranac in western and upstate New York. Lastly in the Northeast around Massachusetts there are the cyberscapes of Sam Adams and Haffenreifer.

The data utilized in Fig. 17.3 are entirely drawn from individual actions with social media as opposed to any specific measure in the material world related to beer, e.g., sales,

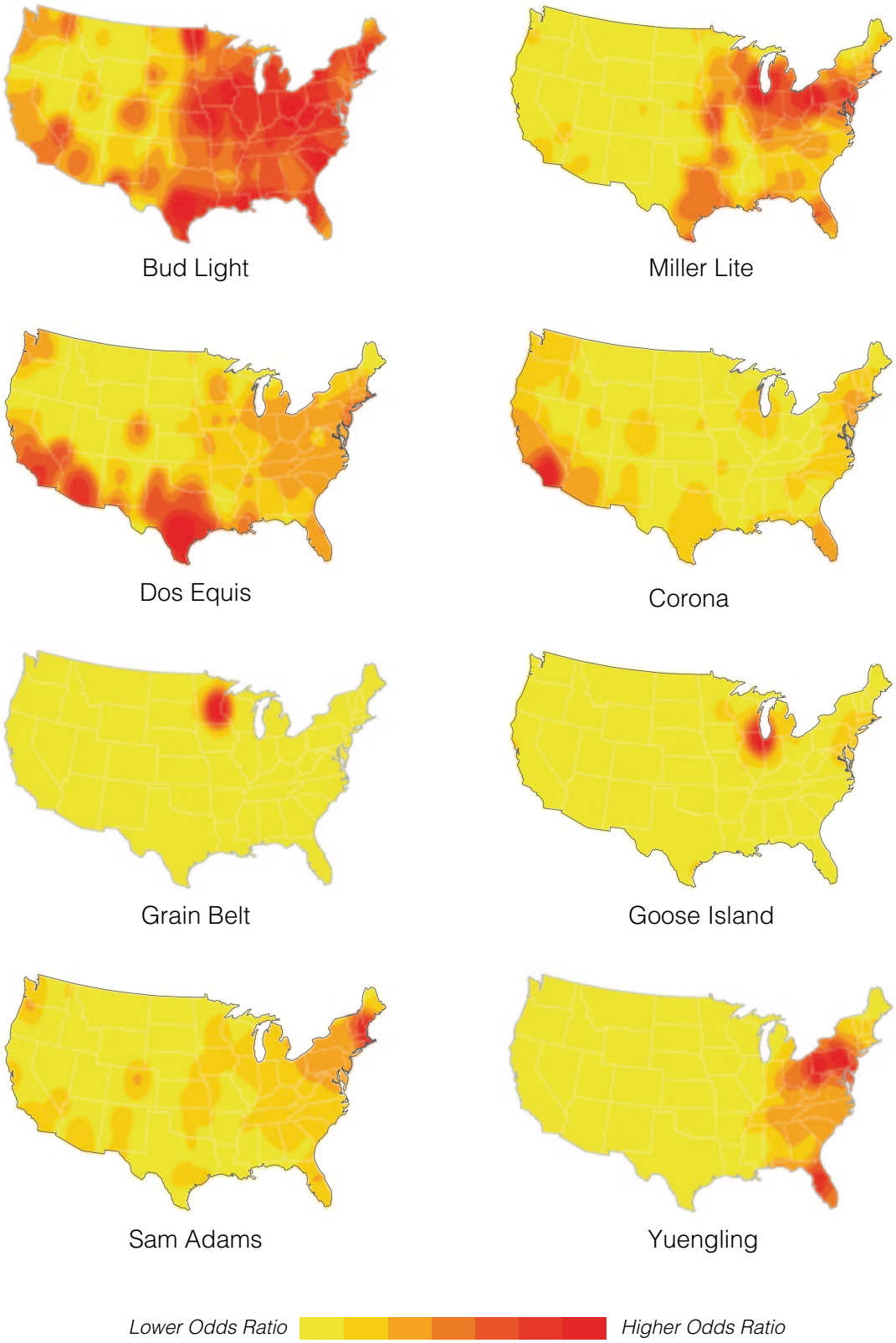

Fig. 17.3 The individual geographies of selected regional "Cheap" beer brands tweets

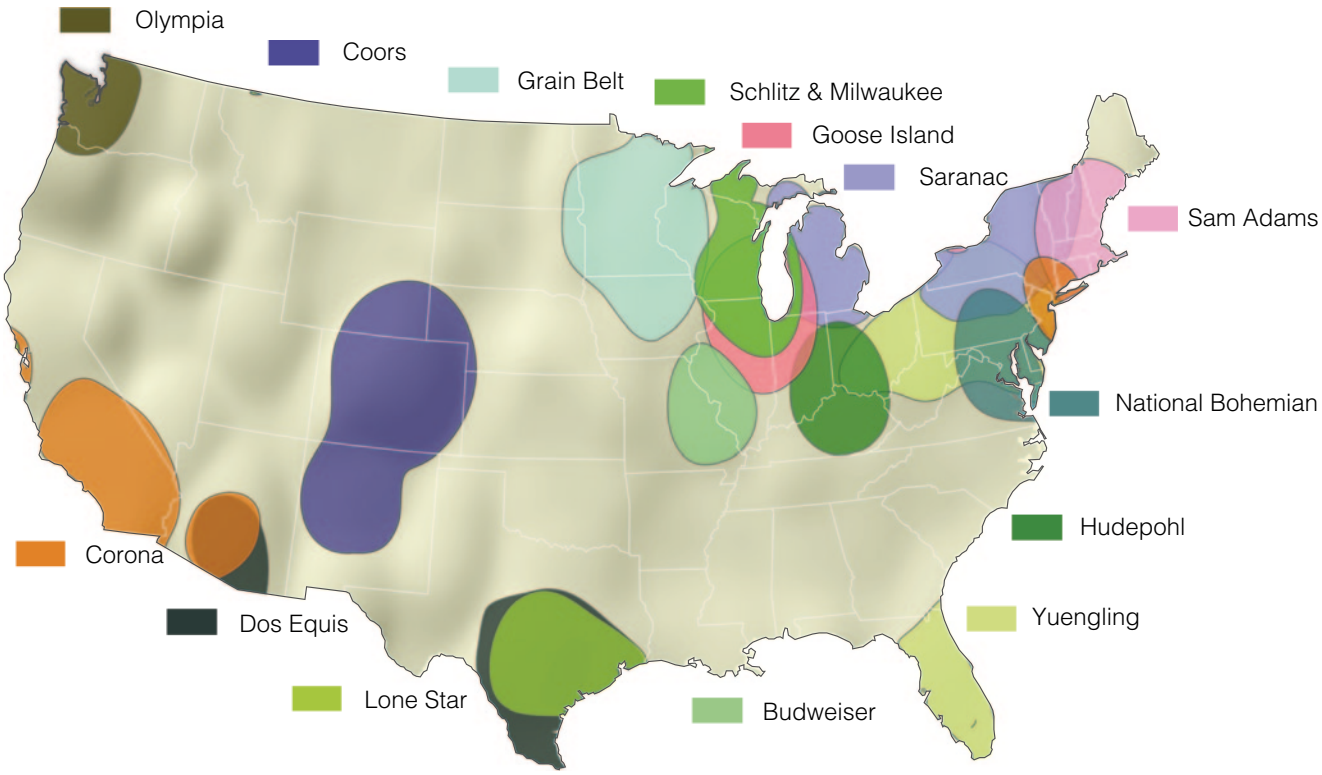

Fig. 17.4 The aggregated geographies of regional "Cheap" beer brands tweets. Brand labels are located adjacent to primary concentrations

production, etc. Nevertheless, the spatial patterns or cyberscapes that emerge have clear relevance to the historical and material presence of beer production and consumption. Tweets in and around the Cincinnati area are much more likely to contain references to Hudepohl than in other parts of nation while Western Pennsylvania contains a relatively high number of Yeungling tweets. In short, this exercise in mapping georeferenced social media about beer shows how tightly imbricated the material and digital worlds are in the twenty-first century.

Conclusion

We increasingly live in a world that is simultaneously practiced and experienced in both the physical and digital dimensions resulting in increasingly hybrid geographies. Far from the simplistic visions of a disconnected cyberspace in which most daily interaction transpires in a virtual reality disconnected from materiality (Gibson 1984), our lives endlessly combine physical and digital actions. Rather than simply drinking a beer, social practice has evolved to also include recording the event by digital picture, status update, review or a combination of all three with a specific geographic location rolled in for good measure. Likewise any digital search about new or specific kinds of beer will almost certainly be influenced by the previous records left by fellow beer drinkers and influence the brands and opinions we are most liable to encounter (Zook and Graham 2007; Graham and Zook 2013). In short, the use of information technologies form a fundamental, yet relatively unstudied, aspect of human geographies in the twenty-first century.

This chapter shows how data produced within social media captures aspects of these digital geographies that can be overlaid on physical space in ways that are highly consistent with offline practice. The distribution of tweets about wine relative to beer show a strong connection to historical, cultural and economic material practices (see Fig. 17.1) as does the variable density of tweets about a range of beer brands (see Figs. 17.2–17.4). While these visualizations are compelling they also highlight some of the potential gaps or short-comings of this approach. For example, all figures show areas in which there is simply not enough digital data to classify them or as in the case of Fig. 17.4, where there are multiple categories within a single region. While problematic, these issues accentuate that the digital dimensions of geography are just as complex and challenging as their offline counterparts. As Shelton et al. (2013, p. 616) argue in the case of online expressions of religion, "The analysis presented here clearly shows how offline practices are inscribed into online representation, but it also illustrates how these reflections have a logic of their own. Old material patterns persist but are layered and filtered through these new activities within the digital realm." This chapter demonstrates that the connections between the online and offline dimensions of beer are equally complex.

The visualizations presented in this chapter could also be conducted for a wider array of beer categories ranging from specific styles, *e.g.*, IPA, ales, lagers, to social movements such as the practices of home brewing and small craft breweries. Moreover, the pervasiveness of social media and volunteered geographic information means that it has great promise in studying the digital geographies of a whole range of cultural and economic phenomenon that goes well beyond the specific focus of this chapter and book. Beer, like many other social practice, may be milleniums old but the socio-spatial practices associated with it—checking into a brewery, posting a review, geotagging a photo—continue to evolve and therefore our approaches to data and research must also evolve to capture these geographies.

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M. Patterson, N. Hoalst-Pullen (eds.), *The Geography of Beer*, DOI 10.1007/978-94-007-7787-3,
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